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EDITORIAL

CHARLES E. STUART (1907-1947)

CHARLES EDWARD STUART, Research Associate of the Parapsychology Laboratory of Duke University and one of the editors of this JOURNAL, died of a heart ailment on March 23, 1947, at the age of 39. When the fatal illness struck him, Dr. Stuart was in the very prime of his productivity. Parapsychology has lost in this untimely tragedy one of its finest and most active explorers, one who was prepared as few other men have been to render it distinguished service.

Stuart was born in the state of Pennsylvania in 1907 of Scotch-Irish stock and was one of a pair of identical twins. He received his advanced education at Duke University where, as an undergraduate, he majored in mathematics and where he took the Ph.D. degree in psychology in 1941. He was an outstanding student, the recipient of a number of distinctions that indicate not only a brilliant mind but a capacity for friendly personal relations as well.

It was while he was still an undergraduate that he became interested in parapsychology. His philosophic turn of mind led him to see at once the significance of the problems in that field. He became one of the first student subjects to participate in the ESP tests and, after becoming familiar with the methods employed, carried out some experiments of his own. These were included in the first

report of the Duke experiments, *Extrasensory Perception,* which appeared in 1934.

Upon his graduation from Duke University, Stuart entered the Graduate School as a student of psychology with a teaching assistantship. When the Parapsychology Laboratory was founded, he was granted a research assistantship in parapsychology, and with that he began the research career which continued unbroken until his untimely death.

While Dr. Stuart's main role was that of an experimenter, his work in the Laboratory was important in a number of other respects. He was an able mathematician and was frequently consulted in this capacity by others outside the Parapsychology Laboratory. He was especially gifted, too, in straightening out difficulties raised by critics of the ESP researches, and wrote a number of articles answering these critics and clarifying the issues raised. In 1937 he helped to found the JOURNAL OF PARAPSYCHOLOGY, on which he served as assistant editor, becoming a full editor in 1942. In 1937, also, he and Dr. J. G. Pratt wrote *A Handbook for Testing Extrasensory Perception,* and in 1940, he collaborated with four other members of the Laboratory staff in writing *Extrasensory Perception After Sixty Years.*

Stuart's earlier experiments consisted mainly of exploratory tests carried out to establish the occurrence of ESP. In one of these experiments he also demonstrated the subjects' ability to *avoid* as well as to *hit* the correct target card used in the test. In these dual calling experiments, in which a right and wrong call were recorded for each card, he obtained approximately equal positive and negative deviations, respectively, for the right and wrong calls made.

In his work as a research assistant, one of Stuart's main experimental projects had to do with the effect of tempo, or rate of response, on success in ESP card tests. He first obtained the subject's favored rate of procedure in the test. Then, using a metronome, he speeded up or slowed down the rate and found that if the subject was hurried too much or slowed too much, he was unable to score above the mean chance average. Thus tempo was found to be important to ESP performance.

The research which Stuart submitted as a thesis for the Ph.D. degree in psychology had to do with affectability and ESP. In his search for a key to what it is that makes high and low scorers in ESP tests, Stuart discovered that subjects who were "unaffectable," as judged from the fact that the score they made on a particular run did not influence their estimate of what they would make on the next run, were the ones who scored highest in an ESP test. The "affectable" subjects scored only at the chance level.

Throughout his research career, the problem uppermost in Stuart's mind was the need to understand the ESP event in terms of the psychology of the person to whom it occurs. He viewed ESP, not as an isolated all-or-none affair, but as a factor in the purposive organization of the individual. As with other mental events, ESP could be understood better, Dr. Stuart thought, if its relations to the needs and motivation of the subject were studied. He realized that ESP may be systematically distorted by the subject in a peculiar, personal fashion on the subconscious level. A more complete understanding of the personality characteristics of the subject might reveal the manner in which this occurs.

It was his thinking along these lines that led him to devise the new technique for testing ESP called the "free response method." In this procedure the subject is free to formulate his own way of dealing with the ESP task. He is not asked to *reproduce* the content of the target picture used as a stimulus, but is requested to write or draw anything that comes into his mind as he thinks about the target picture. These instructions were intentionally made "free," for, as Dr. Stuart pointed out, "it is reasonable to suppose that there are many responses much better than a reproduction, since in everyday life purely imitative behavior constitutes a very small fraction of our total responses."

In conjunction with this drawing method, he developed a new and efficient technique for scoring the response drawings. His "preferential matching method" makes it possible to score a set of four ESP test drawings against the originals and to attach a rating to each drawing separately as well as one to the group.

During his two years at Stanford, where he was Fellow in Psychical Research and Instructor in Psychology from 1942 to 1944,

Dr. Stuart collected data by the use of the free response method both from classroom experiments and from individual ESP tests. The series of papers which have appeared in the JOURNAL OF PARAPSYCHOLOGY since his return to Duke in 1944 have been based in great part upon the Stanford work. They have not only added a broadened foundation of evidence for the occurrence of ESP itself, but have also given some of the more striking examples of displacement, the hitting of a stimulus adjacent to the target aimed at. It was on the basis of Stuart's drawings and his method of scoring them that Dr. B. M. Humphrey discovered that the form quality of drawings made in ESP tests can serve to distinguish the high- from the low-scoring subjects. Without Stuart's large collection of already scored drawings, it is doubtful if this new line of study on the relation between ESP and the personality traits revealed in the drawings could have been inaugurated.

Dr. Stuart's own interest in this personality relationship was a dominant one, and while at Stanford he himself initiated a parallel line of investigation. When he was giving tests to his subjects there, he also gave them a special type of interest test from which he obtained an indication of their individual interest patterns. When these interest patterns were examined in connection with high and low scoring in the ESP tests, it turned out that there was a significant relationship.

In addition to predicting whether an individual subject would score above or below chance expectation, Dr. Stuart used the interest test results to develop a formula whereby he could also predict with some accuracy how much the deviation from "chance" would be in the total results of any given experiment. During the past year, his work with this predictive technique was lighted with many a moment of high satisfaction at seeing the method work out well in predicting the scoring rate in many cases. Just how far this method can go and how reliable its prediction value is cannot be ascertained until his unfinished work has been made ready for publication. But everyone who appreciates the importance of his task and the bold undertaking on which he had set out will feel keenly the loss of so capable an explorer on this advanced frontier of science.

Upon all those who knew Dr. Stuart personally he has left a

lasting impression of boundless geniality, of patient willingness to understand opposing points of view, and of readiness to aid his associates. Much of his time went into helping others out of their technical difficulties. He was devoted to his family, friends, and work. His physical health prevented his participation in outdoor life, but he was well-rounded in his interests, and sensitive especially to the realm of the fine arts. In its application to Charles E. Stuart, the word "gentleman" takes on its true significance.

J. B. R.

ESP TESTS IN LIGHT AND DARKNESS

By J. M. Bevan

ABSTRACT: A group of 12 subjects were given a series of tests in which they were asked to identify by extrasensory perception a deck of ESP cards located with the experimenter in another room. The main purpose of these tests was to compare the effect on the subject of working in the light and working in complete darkness. The 48 runs through the deck of cards in the light gave higher scores than did the same number of runs in the dark. The difference between the two conditions was significantly greater than "chance." In addition, similar tests were made with pictures instead of cards, the subjects attempting to make drawings which would reproduce the unseen pictures. These drawings were then judged for certain personality traits, which, it has been found by Dr. B. M. Humphrey, can be estimated from the form of the drawings. The traits compared were expansiveness and compressiveness, and here, as in Dr. Humphrey's work, these traits were found to be connected with success and failure in extrasensory perception. The more compressive individuals did well in half of the tests, where the sender was looking at the stimulus pictures. They did poorly in the other half with no one looking at the pictures.

Mr. Bevan is a Graduate Assistant in the Parapsychology Laboratory at Duke University.—Ed.

Introduction

Following the experimental establishment of the occurrence of ESP, an increasingly large section of the research in the field has been devoted to determining the conditions which affect the functioning of the ESP process. Very few of these studies, however, have dealt with the role of concentration and the effect of distracting conditions in the test environment, and no specific experimental atttempt has been made to find out the effect on extrasensory perception of a relatively complete absence of sensory stimuli.

Certain studies and observations have suggested that ESP would be improved under conditions restricting sensory activity. It has been noted, for instance, that spontaneous ESP experiences frequently occur while the subject is asleep or in a state related to sleep. Another fact of interest is one that is referred to by several investigators; namely, that their subjects seemed to prefer to work in a state of quiet abstraction, closing their eyes, or staring before them in a trance-like manner. Furthermore, there is the slight advantage often encountered when the ESP cards are removed to a distance

from the subject. It would seem that the mere presence of the cards may operate to excite processes that compete with ESP. All these observations suggest that distracting sensory stimuli of different orders may seriously handicap the ESP ability of the subject.

On the other hand, it should be mentioned that in his study of ESP ability in a medium (**6**), J. B. Rhine found no appreciable difference between the medium's scores when she was in a normal state and when, with eyes closed, she was in a self-induced trance which supposedly cut off a great deal of sensory stimulation.

The PK experiments have given results which are more to the point on this matter of the effect of restricted sensory stimulation on PK performance. In view of the close association now known to exist between ESP and PK, these findings are of great interest also in connection with ESP. Gibson (**1**) compared the PK performance of his subject, L.H.G., in ordinary light, in red light, and in darkness. While he obtained his most significant scoring in darkness, it was significantly *low* scoring, as contrasted with the significantly high scoring which his subject ordinarily produced when working in the light. In red light she scored approximately at the average expected from chance. More recently Miss Elizabeth McMahan has made a comparison of the effect of light and darkness on the performance of children throwing discs in PK tests (**4**). In that experiment the darkness tests gave positive scoring while the tests in the light gave approximately an equal deviation on the negative side of mean chance expectation. Miss McMahan, however, attributes the better scoring in darkness to the greater interest which the children had in these more novel conditions.

From this brief review of the situation it may be seen that a definite experiment is needed to help in answering the question of whether in ESP tests success is affected by the presence and absence of sensory stimulation in the course of the testing. The findings in the two PK researches mentioned do not permit of wide generalization in any case, and it is important to eliminate, if possible, the special factors that entered into these investigations of PK in darkness. For example, Gibson's work was confined to one subject, and McMahan's represented the introduction of darkness as a new modification so that the interest factor was important, especially since her

subjects were children and adolescents to whom such innovations were appealing.

The primary objective in the present study, therefore, was to examine experimentally the effect, on the ESP scoring rate, of a relatively non-stimulating test environment. The most important condition was, of course, the elimination of visual stimulation for a comparison of the effects of darkness and normal light. It was considered important also to eliminate variables of auditory character in the test situation by using a special soundproof room.

The experiment developed as part of a more general study of the effect of attitudes of belief and disbelief in ESP on scoring rate in ESP tests. This research on attitudes is still going on and will be published later.

The Experiment

The experiment was begun at Duke University on October 14, 1946, and was completed on December 19, 1946. I myself carried out all the experimental sessions, using as subjects 12 university students, eight women and four men. They were selected on the basis of their attitudes toward the possibility of ESP. Prospective subjects were asked whether they believed ESP to be an established fact or whether they were undecided as to its status. Six of those who believed in the occurrence of ESP (these were called "sheep") and six who were undecided (these were called "indecisives") were chosen as subjects in these tests. As an additional check on their attitudes, they were asked to fill out an attitude questionnaire at the beginning of each test session.

Since this experiment was planned as an adjunct to the research on attitudes, mentioned above, certain of the testing conditions were dictated by the form of the first series. One such condition was the use of alternating clairvoyance and GESP runs. Since these runs were made under both light and dark conditions, it will be necessary to describe the special apparatus used before discussing the actual testing procedure in detail.

Apparatus

The room used by the subjects in the tests measured eight feet by ten feet and had no windows. The walls were one foot thick,

insulated with rock wool, and fitted with double doors. The furnishings were an easy chair, a table, a small electric fan, two lamps (one table lamp and one floor lamp), a plaque and various pictures on the walls, and the recording apparatus sealed in a box which rested on the arms of the subject's chair during the test. Such a room, when the lights were on and the fan going, provided the ordinary distractions and stimuli to be found in the usual experimental situation.

The experimenter's room was 35 feet away. It was fully lighted throughout the experiment.

The alternating light and darkness were introduced into the subject's room by a rotary switch in the experimenter's room. At the beginning of a run, this switch was thrown by the experimenter and the lights in the subject's room went on and off several times, thereby warning the subject that the experimenter was ready to start. The place at which the armature of the switch came to rest determined whether, after the initial few flashes, the lights stayed on or off. The same switch controlled the fan, which went into operation when the lights were on. Although the experimenter himself threw the switch, he did not know which of the conditions was being effected. He was able, however, to provide the necessary alternation between light and darkness merely by turning the nob of the switch any odd number of notches forward.

When it was necessary for the experimenter to enter the subject's room in the course of a test, he pressed an electric switch at the entrance and this turned on the lights if they were not already on.

Because of the difficulty of recording in the dark, special recording apparatus was needed. This apparatus, as well as the signaling device, was built by Mr. W. B. Scherer of the Parapsychology Laboratory. It consisted of a wooden box, 12 inches long, 9 inches wide, and 6 inches deep, which was attached to the bottom of a board 24 inches long and 12 inches wide. Inside the box was a series of rollers over which a paper tape was run in such a way as to leave a flat writing surface at the top. A crank lever on the outside of the box put the rollers in motion and sent the tape forward an inch each time it was used. Directly above the flat portion of the tape there was an opening in the box large enough to allow an ESP

symbol to be written. By resting his hand above this aperture the subject was able to record in the dark. He wrote the desired symbol in the open space, pushed the crank lever, wrote another symbol, and so on, thus maintaining a recognizable sequence. The rollers were so constructed as to prevent a reverse turn in order to guard against possible tampering with the record. One of the rollers was spiked with small pins which perforated the paper each time the tape passed over it. Pulling the tape back would cause the pins to tear the paper.

As a signal device to synchronize experimenter and agent throughout the run, Mr. Scherer set up a telegraphic click system, with the clicking portion of the apparatus in the experimenter's room. The signaling switch was connected to the crank lever of the subject's recording box, and it automatically closed when the subject pushed the lever to move the recording tape forward.

Procedure

Each subject performed a total of eight runs, equally divided between two experimental sessions. A session comprised two GESP and two clairvoyance runs, with two GESP runs done first, followed by two clairvoyance runs, or vice versa. Whatever the order was in one session, it was reversed in the second. The two sessions were never held on the same day.

The method of testing used in the clairvoyance part of the experiment was the distance BT technique with ESP cards. The subject, in one room, tried to guess the cards which were placed before the experimenter in another room. The experimenter first shuffled the deck thoroughly by hand and turned it face-down. He then threw the switch which controlled the lighting in the subject's room. The subject was already seated in his room ready to begin. As soon as he knew what the lighting conditions were to be, he wrote the appropriate letter in the open space on the record tape—"D" for dark or "L" for light. Then he pushed the crank lever on his box, which sounded the clicker in the experimenter's room and notified him to expose the first card. When the experimenter heard the click, he removed the top card from the deck and laid it face-down on the table. When the second click came, he removed the second card also onto this other pile for recording at the end of the run,

and so on through the deck. At the end of the card run of 25 trials, the experimenter turned the rotary switch twice, thus flashing the lights in the subject's room and signaling to him that the run was complete.

The same procedure was used in the GESP runs except that in the latter, of course, the experimenter looked at each card while the subject was trying to identify it extrasensorially.

Special precautions were taken that the experimenter should be in ignorance at all times of the conditions in the subject's room, since he otherwise might be influenced in his capacity as sender. All he knew was whether the run being done was GESP or clairvoyance and that the lighting condition for any given run was opposite to that of the previous run in the same session. Whenever he entered the subject's room it was lighted and there were no clues by which he could deduce the conditions under which the preceding run had been conducted. As a further precaution, the subjects were instructed never to disclose to the experimenter the condition prevailing in any particular run.

Numbered record sheets were used by the experimenter and these were passed in with the card orders at the end of each session to the Record Librarian, Dr. Betty M. Humphrey.

After every few experimental sessions the paper tape was removed from the subject's box by Mr. Scherer and this also was given to Dr. Humphrey for checking against the card orders. She made a record of the hits for clairvoyance and GESP runs under both light and dark conditions and, at the end of the experiment, gave all the data to the experimenter, who made an independent check.

As an incidental part of the main experiment, a series of ESP tests based on drawings was introduced. These tests grew out of the work of Dr. Humphrey on the discrimination of high and low scoring in ESP on the basis of the form quality of ESP response drawings (**2, 3**). She reported that the subjects making the more expansive drawings in clairvoyance tests gave higher scoring rates than those making compressive drawings. The opposite relation was found in the drawings made in GESP tests. The clairvoyance and GESP tests, however, on which her findings were based were

not given to the same subjects at the same session. In view of the fact that the present research did involve a comparison of GESP and clairvoyance tests by the same subject at the same experimental session, an excellent opportunity was afforded to obtain more closely comparable material for a study of the relation between expansive-compressive characteristics and success in clairvoyance and GESP tests.

Accordingly, each subject was asked to do a drawing test between the second and third runs and at the end of the fourth run of each session, making a total of four drawings for each subject. The drawing was to be a clairvoyance drawing if it followed clairvoyance runs, a GESP drawing if it followed GESP runs.

The pictures used as stimuli for this part of the experiment were taken from a collection of magazine pictures mounted on cardboard. They were selected by Dr. Humphrey in units of four and were enclosed by her in manila envelopes. For the clairvoyance part of the experiment, the envelope was sealed and a sheet of paper was fastened to the outside. The subject was instructed to make a drawing in response to the picture concealed within. In the GESP part of the experiment, the envelope was not sealed. The experimenter, as sender, removed the stimulus picture and looked at it while the subject, in the other room, was making his drawing. At the end of the session the experimenter listed the order of response drawings and the order of the stimuli for future checking.

When the entire experiment was completed, the experimenter turned in the stimulus pictures and response drawings. The latter were then judged for expansiveness and compressiveness (E-C) by Dr. Humphrey and by Dr. C. E. Stuart independently. To each drawing the judge assigned one of the following ratings: 1 = expansive; .5 = indeterminate; 0 = compressive. If the average of the two judges' ratings was .5 or above, the drawing was termed expansive; an average score below this level made it compressive. The purpose of this classification was to determine whether the expansives differed from the compressives in respect to their ESP scores on these same drawings and their ESP scores on the card runs.

The comparison was made for the card data by adding up the

subject's clairvoyance card run scores and then adding up his E-C ratings on the clairvoyance drawings. If the latter put him in the compressive class, his clairvoyance card scores were credited to the compressive group. Otherwise, of course, they went to the expansive group. The same was done for the GESP runs.

The comparison between expansives and compressives on the drawing scores was made by the same procedure. First, of course, the scores on the drawings had to be found. They were obtained by having the drawings matched according to the Stuart preferential matching method (**7**) by Dr. J. G. Pratt and Mr. W. R. Birge. Using his list of the order made at the end of each session, the experimenter compiled the scores from these matchings. (These were independently rechecked by Dr. Humphrey.)

Results

Card Runs

A total of 96 runs were completed, and they yielded 482 hits where chance expectation would have given 480. This gives an insignificant deviation of +2. However, the comparison of scores obtained in the light and dark affords data of somewhat greater interest. (See Table 1.)

Table 1

Comparison of Card Scores in Light and Dark Conditions

	Light			Dark			CR_d
	Runs	Dev.	Av. Score	Runs	Dev.	Av. Score	
Clairvoyance	24	+ 6	5.25	24	−16	4.33	1.59
GESP	24	+20	5.83	24	− 8	4.66	2.02
Total	48	+26	5.54	48	−24	4.50	2.55

The 48 runs done in the light situation gave a deviation of +26, and the 48 runs done in the dark gave a deviation of −24. This difference of 50 hits between the two conditions gives a CR of the difference of 2.55, with a probability of .0054. The probability, when corrected because there was no hypothesis as to the direction of the difference between the two conditions, is .0108. Hence the

scoring in the light was higher to a marginally significant degree than that in the dark.

The difference between the GESP runs and the clairvoyance runs is insignificant, the GESP runs having a deviation of +12 and the clairvoyance runs having a deviation of −10. GESP and clairvoyance contributed almost equally to the difference of 50 hits between the dark and the light conditions.

Drawings

There were a total of 48 drawings, 24 done with the GESP technique and 24 with clairvoyance. The drawing scores, which were obtained from the preferential matchings, are shown in Table 2. They have a total deviation of +40. Since no drawings were done in the dark situation, the only comparison possible is between the GESP and clairvoyance drawing scores in the light. These

Table 2

ESP Scores for Drawings

	Number Subjects	Dev.	Mean Score*	t	t_d
Clairvoyance....	12	− 6	19.50	.40	2.62
GESP.....	12	+46	23.83	3.53	
Total.....	12	+40	43.33	1.56	

* Mean chance score for each technique = 20. Mean score for the total = 40.

gave a deviation of −6 for the clairvoyance and +46 (with a significant t of 3.53) for the GESP. The t of the difference is 2.62, with a probability of .008, which becomes .016 when doubled because there was no hypothesis as to the direction of the difference.

Expansion-Compression

On the basis of the E-C ratings on the 48 drawings, the subjects were divided thus: 11 of the 12 subjects were compressive in both the GESP section and the clairvoyance. The twelfth was compressive in the GESP part of the experiment and expansive only in the clairvoyance.

Cards. When the expansive and compressive subjects were com-

pared with respect to their scores on the card runs, the results were as shown in Table 3.

Table 3

COMPARISON OF CARD RESULTS FOR EXPANSIVES AND COMPRESSIVES

	EXPANSIVES		COMPRESSIVES	
	Runs	Deviation	Runs	Deviation
Clairvoyance.....	4	+2	44	−10
GESP.....	0	0	48	+10

Since there were no expansive GESP drawings, the only comparison possible in regard to the scores on the card runs is between the clairvoyance and the GESP for the compressives. These scores were −10 and +10 respectively. The results are not significant. However, they do display a trend in the direction found by Dr. Humphrey: that compressives do well at GESP drawings tests and poorly at clairvoyance.

Drawings. When the expansive and compressive subjects were compared with respect to their scores on the drawings, the one subject who did the two expansive clairvoyance drawings had a deviation of +5, and the 11 compressive subjects had a deviation of −11 on their clairvoyance drawings. (See Table 4.) The compressives in the GESP test had a deviation of +46, giving a t of 3.53 with a probability of .0024. (Since all the subjects in the GESP tests were compressive, these figures are the same as those for the total GESP tests shown in Table 2.) However, because there were two

Table 4

COMPARISON OF DRAWING RESULTS FOR EXPANSIVES AND COMPRESSIVES

	EXPANSIVES		COMPRESSIVES			
	Number Cases	Deviation	Number Cases	Deviation	t	t_d
Clairvoyance....	1	+5	11	−11	.63	2.92
GESP.....	0	0	12	+46	3.53	

types of drawings and the results of only one were significant, it is necessary to multiply this probability by 2. The corrected probability is .0048. When we compare the clairvoyance and GESP work of the compressives, we find a significant difference between the two, a difference with a t of 2.92. Here again there is support for Dr. Humphrey's previous findings that compressives do well at GESP and poorly at clairvoyance.

The Relation of Attitude

The comparison of the effect of attitude on scoring showed no differences of any statistical significance. The detailed figures will be of greater interest in connection with the larger research on the relation of attitude already mentioned and will be presented in the forthcoming report on that study.

Discussion

The experimental set-up eliminated the possibility of sensory cues, and the counterhypotheses of lost record sheets and checking errors are met by the fact that all record sheets were numbered and accounted for and that the data received two independent checks. The expansion-compression judgments were made with complete independence of any knowledge of the scores.

This leaves the counterhypothesis of chance to be considered. The CR of the difference (2.55) between the card scores in the light and dark conditions is marginally significant. The same holds true for the t of the difference (2.92) between the GESP and clairvoyance drawings of the compressives. One fact in regard to the drawings should be mentioned, however. All stimulus and response drawings, together with the experimenter's lists of the order, were kept in the possession of the experimenter until the end of the experiment. Since the envelopes containing the GESP drawings were unsealed, a critic who felt justified in questioning the experimenter's honesty could contend that he might have altered the drawings or changed the lists of the order in such a way as to have produced spurious figures in the clairvoyance-GESP comparison of the compressives.

The data of the experiment offer evidence that the ordinary experimental environment is more conducive to high ESP scoring

than the one where visual stimulation is eliminated. The reason for this may be that the dark situation is too strange and too oppressive. It can safely be said that when the experimental procedure itself is sufficiently distracting to command the subject's conscious attention, it will probably also interfere with his scoring. In this case, it may be that the *lack* of an ordinary amount of stimulation was the disturbing influence and that the darkness served actually to inhibit ESP responses. To go still further, the fact that the scores shown in Table 1 under the dark conditions tend to be below chance may suggest that there was a frustrating, annoying effect of darkness that led to rejection of the stimulus and not merely to an incapacity to perceive it. This view would be in line with Gibson's results showing a significant negative deviation in PK tests in darkness, and it need not conflict with McMahan's contrary findings. McMahan's subjects quite obviously liked the dark. It is likely that the adults in the other cases did not have this strong positive preference for it.

Another possibility is that in his ordinary surroundings the subject may find the stimuli about him to be, not obstacles, but facilitating factors. From the welter of sights and sounds about him he may unconsciously pick out certain ones which "float" his extrasensory perceptions up to consciousness. In the dark quiet situation, on the other hand, there is nothing to divert his mind from introspection and self-consciousness, which have often been pointed out as unfavorable to the functioning of ESP.

In her comparison of ESP performance in blind and non-blind children (5), Price found that only a slight and insignificant advantage seemed to be shown by the blind. Here, if the samples are representative, is something of a comparison in point. Mere visual stimulation as such—or the absence of it—apparently is not a determining factor. Rather, it is a matter of how the subject adjusts to those conditions. Perhaps, if the normal seeing subjects could be fully adjusted both to the darkness and the light, neither condition would prove to be in itself inhibiting. Taking all the relevant work into account, we are led to the view that it is not the test condition itself as such but its effect upon the subject that must be considered in the search for factors affecting psi performance.

A second noteworthy fact in this experiment is the consistent superiority of scoring in the GESP sections of the data. In this experiment for the first time the subjects did both clairvoyance and GESP drawings in the same session, and the comparison between the two techniques therefore is based on conditions as nearly identical as it is possible to get them. The consistently superior GESP scoring adds weight to the hypothesis already cited: that compressives do well at GESP and poorly at clairvoyance. All subjects except one in this experiment were compressive, and that one was expansive only in the clairvoyance situation.

The question has been asked previously (**3**, p. 194) whether the same subjects, by varying their degree of expansion-compression, can succeed at both GESP and clairvoyance or whether they maintain a fairly constant level of expansiveness or compressiveness with the compressive group succeeding at GESP and failing at clairvoyance. The data of this experiment, where the subjects did both clairvoyance and GESP in the same session and where GESP scored higher, suggest the possibility that there may be a fairly constant level and that the compressive tendency to do well at GESP and poorly at clairvoyance is a somewhat stable characteristic of the individual.

Although such discussion can be only speculative, it is interesting to ask why almost all of the drawings in this experiment were compressive. The answer may lie in the experimental environment. Compressiveness in drawings is defined as that quality which gives a feeling of being shut in, of pressure, of isolation. It is based on a fearful concept of space. It would be strange if the subject in this experiment was not burdened with a sense of being shut in, both physically and psychologically, and of being oppressed by the darkness. Such a feeling might well have carried over into the drawing situation to such an unusual degree that even otherwise expansive subjects felt constricted and inhibited.

That compressed subjects under these conditions should do well at GESP would be a reasonable psychological hypothesis. In the GESP runs the subject's experimental task involved contact with another person, the experimenter, who looked at the cards which the subject was trying to guess. The subject may have been moti-

vated by his sense of isolation to reach out by ESP for the contact with the experimenter which was afforded by the GESP situation. In the clairvoyance test, of course, there was no one to contact, and that may explain why the clairvoyance scores were low.

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Parapsychology Laboratory
Duke University
Durham, North Carolina

RHYTHMS OF SUCCESS IN PK TEST DATA

By J. G. Pratt

ABSTRACT: Yet another large series of record sheets from a PK experiment, made to test the possibility of a direct mental influence upon the fall of dice, was analyzed to find the way in which the successful rolls were distributed in the "sets." The set consisted of a block of three columns, each with 12 entries and each entry showing the two faces rolled in throwing a pair of dice. In some of the tests, the purpose of the roll was to get high dice (two faces which added up to more than seven); in others, the aim was to get low dice (two faces totaling less than seven). High dice rolls were recorded in the upper part of the record sheet, and low dice rolls in the lower part, and each half of the page consisted of three sets, or a total of nine columns, across the page.

Earlier studies had shown that the successes were very definitely grouped on the page. The purpose of the study described here was to find exactly how the hits were distributed on the record page and what caused them to be grouped instead of being evenly spread throughout all the trials. It was found that only a small part of the record page showed an outstanding rate of scoring. Only in the first column on the page was the success far above "chance," and even in those trials the hits were clustered at the start and end of the column. This high beginning and ending gave a distinct U-curve of hits within the column. When the page was broken down into its natural sets, it was found that the first column in the second and third sets showed some of the same characteristics as the first column on the page. Also, the higher the score for the column, the more distinctly U-shaped was the distribution of the hits within it.

The indications are, therefore, that most of the time spent in the tests was wasted because of some psychological blocking of the psychokinetic factor.—Ed.

Introduction

THERE IS ONE question that, more than any other, is always before the research worker in parapsychology: What are the factors which so drastically limit the level of success attained by most subjects in tests of their psi capacities? Experimental observations which have any possible bearing on this question are of inestimable value at the present stage of the research.

This need to know the factors affecting scoring adds greatly to the importance of the study of position effects, the lawful distribution of hits according to the location of the trials in the record. When test results are analyzed according to the structure of the natural units of the data—column, set, page—we find that the major suc-

cess of the subject is restricted to certain areas of the record structure. Most of the remaining trials give scores which are not significantly different from the expected chance average.

The significant patterning of scoring success in the records can be explained only in psychological terms, and this feature of the results therefore offers a particularly favorable opportunity to get at some of the psychological factors in psi phenomena. We know, on the basis of the published findings from general analyses for position effects, that there is something in the test situation which inhibits the subject on many of his trials. This has been particularly true in the PK tests, where the analysis of the records has shown such consistent and statistically significant position effects that these have become the most conclusive kind of evidence that PK does occur.

The fact that these position effects have already been presented as evidence for PK does not mean that they have no additional value as scientific observations. Indeed, their strength as evidence for PK only enhances their importance as psychological phenomena. *What causes these effects?* Only by first solving this problem can we hope to learn to control the factors of the test situation in a way that will permit the subject to score consistently at his highest level.

Specifically, a search is needed for detailed knowledge of just where, in the fine structure of the test, the success comes in, or fails to appear. We need to take apart those series which have shown the most significant position effects by former methods of analysis; to analyze them in terms of the smallest unit of the data, the individual trial; to find out by systematic comparison of different groupings of trials how these effects are related to the entire series, the page, the set, the individual column, different targets, higher and lower scoring sections, and to other conditions in the test situation. We cannot afford to overlook any opportunity to uncover and track down all possible clues to the nature of these causal factors.

Progress along this line of investigation has been reported in the three preceding numbers of the JOURNAL (**1, 2, 3**). Especially did the detailed study of the data of subject L.H.G. in the Gibson Cup Series reveal a number of lawful relations between position effects and aspects of the test situation. Those discoveries empha-

size the need to extend these investigations to some of the other series available.

The Series Selected for Study

The PK records which were selected for further analysis in this study are the High-Dice Series and the Low-Dice Series done by Margaret Pegram Reeves and reported jointly by Reeves and Rhine (4). These two parallel experimental series seemed like a fruitful area of further exploration for several reasons. They were the work of a single subject, and thus they avoided the danger that individual psychological peculiarities might be obscured by pooling data from two or more subjects. These records provided a sufficiently large batch of data to justify detailed analysis. Finally, the original report of this series showed that it contained highly significant position effects and therefore gave the assurance that intensive study of these data would be rewarded.

The tests were conducted by M.P.R. at Guilford College, and she was her own subject. The procedure was about as direct and as simple as it could have been. Two dice were thrown at one time from the subject's cupped hand onto a blanketed surface so that they bounced against a wall. For some throws, known as the High-Dice Series, the subject tried to influence the dice to fall so that the sum of the two faces uppermost was eight or above. On other trials, which comprise the Low-Dice Series, her aim was to get a pair totaling six or below. Whether the target for any particular throw was high dice (HD) or low dice (LD) was, of course, always designated in advance. In this experiment, there is very little likelihood that any mistake in target designation could have been made, for the results were recorded in bound composition books, and the HD trials were regularly recorded on the upper half of the page, while the LD trials, with the exception of a single page, filled the lower half.

The position effects to be reported are closely related to the structure of the record page, and it is therefore important to have clearly in mind the exact manner in which the data were kept. There were, as stated, two main sections of the record page, the upper one devoted to the HD trials and the lower one to the LD series. Each half of the page typically showed the results of 108 throws of the

pair of dice recorded in nine columns of 12 throws each. Each group of three columns was scored as a unit, and each half of the page therefore contained three such three-column sets. It has become accepted practice to consider 12 throws of a pair of dice as a run in high-dice and low-dice tests for PK, and this convention will be followed in the present study.

The total results of the two series as given in the original report were as follows: There were 492 HD runs, which averaged 5.59 hits where 5.00 is chance expectancy, a result which gave the highly significant CR of 7.65. For the LD series, there were 435 runs, which averaged 5.21, the CR being 2.58. Thus each series gave an independently significant result. The fact that the same dice were thrown for opposite targets, HD and LD, ruled out an explanation of the findings solely in terms of biased dice.

The presence of significant position effects in the records was discovered by members of the Parapsychology Laboratory staff who were checking over the data preparatory to writing the research report. Thus the experimenter was totally unaware of this form of evidence in her records, and motivated errors could not have influenced these results. Four kinds of position effects based upon different ways of pooling the records directly from the original page were presented in the first report.

When all the columns of both the HD and the LD series were combined, it was discovered that the upper half of the column scored significantly higher than the lower half. The CR of the difference was 2.52.

When all the three-column sets were combined it was found that the highest score was made in the first column and the lowest one in the third one. The CR of the difference between the first and second columns was 2.68; that between the first and third, 3.86.

A comparison of the three sets across the page showed a general decline in success. The drop, however, was found only between the first and second sets. The second and third sets gave practically identical score averages. The CR of the difference between the scores of the first and second sets was 1.78. This result is not significant, but it gains in psychological importance when considered in connection with the other declines reported for this series.

A fourth analysis of position effects in these records was for terminal salience within the 12-trial column. It was found that a higher rate of scoring was obtained at the beginning and at the end of the column than in the middle positions. To get a measure of this effect, the investigators divided the pooled column into four equal segments and evaluated the differences between different end and middle segments. They found the following CR's of the difference: between the first and second segments, 3.37; between the first and third, 4.98; between the third and fourth, 3.02. In view of the size of these CR's there could be no doubt of the fact that the U-curve observed in the pooled column of both the HD and LD series was highly significant.

Procedure

The plan of the present study is to carry these position effect analyses into the fine structure of the set, tracing them right down to the individual trial to minimize the risk of overlooking any fact of possible psychological importance for an understanding of these scoring trends. To facilitate these analyses, the data of individual sets were transcribed onto single-column strips to show where the hits occurred in terms of the exact sequence of 36 trials. These sets could then be laid side by side and combined to get the final data in any analysis which was required. Accuracy was assured by comparing the results with the findings of former studies made upon these same data.

The first step will be to show the position effects in the pooled set of the HD and of the LD series, separately. Some findings bearing on the objectives of this study may come out of a comparison of the two series at this general level. In any case, this analysis will reveal the general characteristics of the position effects in each of the three columns of the set. With the composite sets of the two series thus laid out before us for inspection it will be possible to single out the part of the set in which position effects are sufficiently marked to justify detailed study and also to decide what high-scoring and low-scoring trial positions will be used in further statistical analyses. In this way a strictly quantitative study of the position effects in relation to factors which may have influenced them can appropriately be made without our running the risk of

selecting favorable statistical groupings of the data after the facts are known.

Following the practice adopted in the preceding reports on detailed analyses of position effects, the results of this study will be shown primarily in the form of graphs. Some of these are bar graphs which show the average level of success attained in the tests in terms of the 12 separate trial positions of the column. The arrangement of these particular graphs has been planned to reflect closely the sequence and order of trials on the record page.

Results

Position Effects in the Series as a Whole

A comparison of the *pooled sets* of the two series, it was pointed out above, seemed to be the most fruitful starting point for the detailed study of these records. By pooling all the sets in each series, the two parts of the experiment are reduced to the lowest common denominator. When at the same time each recording position is kept distinct to show the trial-by-trial variation in score average, the essential features of the position effects are revealed both within the individual column and among the different columns of the set.

The composite sets of the two series are shown in Figure 1, with the HD data in the upper half and the LD results below. The first suggestion arising from an inspection of these six columns is that the U-curve previously reported is not equally characteristic of the three columns of the set. For both the HD and LD series, the first column of the set appears to give a much more striking U-curve. This effect is particularly pronounced in the first column of the LD set.

We already know, on the basis of the original Reeves and Rhine report, that the position effects in these records are significant. We are therefore justified in being guided here to a considerable extent by convenience in deciding how we will measure these same scoring trends. What is important is that the method adopted be applied consistently throughout all the analyses. It was decided purely on the basis of an inspection of Figure 1 that the difference between the combined score on the middle six trials of the column and that of the

terminal six trials, the three at the beginning and the three at the end, would be used as a basis of evaluating column salience in these data. Throughout this report the six middle trials of any designated column will be indicated by the letter "M" and the six terminal trials by "T."

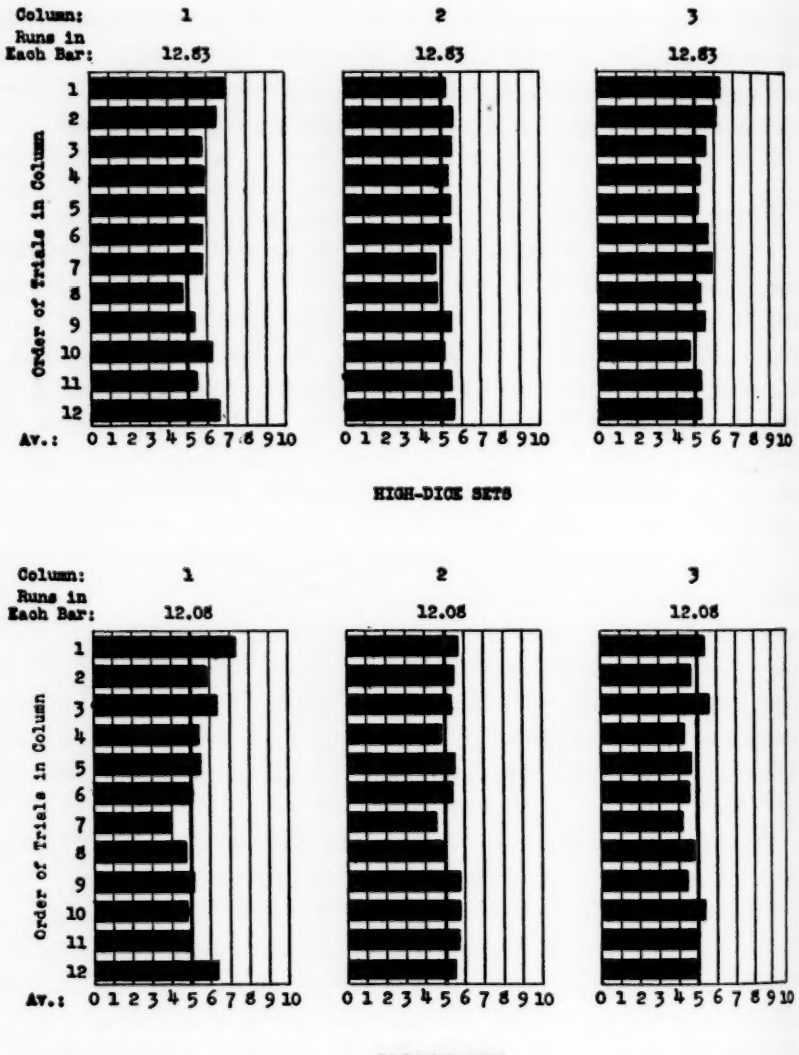

FIG. 1. Composite sets showing position effects in the High-Dice Series and in the Low-Dice Series in terms of average per run for each of the 36 trial positions of the set.

To evaluate by this method the column salience of all the data combined, the six columns shown in Figure 1 may be pooled. The six T-trial positions give 224 more hits than do the six M-trial positions. Each group represents the equivalent of 448.5 runs.[1] The SD of the difference is 51.15, and the CR is 4.38. This result shows that when all the columns are lumped together, the T-trial positions score significantly higher than the M trials.

The difference in the degree to which the HD and the LD series contribute to this total effect is an interesting observation in itself. The HD series, which gave far higher scoring, shows only an insignificant amount of salience in its composite column. The T trials for all HD data yield only 78 more hits than do the M trials. Here each group represents 231 runs. The SD of the difference is 36.71, and the CR of the difference is 2.12. In the pooled column of the LD series, on the other hand, the T trials show 146 more hits than do the M trials. In this case, with 217.5 runs in each group, the SD of the difference is 35.62 and the CR of the difference is 4.10. Here we have an illustration of the fact that more pronounced position effects need not necessarily be associated with the higher general score average.

A clearer picture than Figure 1 gives of the terminal salience throughout the set is obtained if the scoring trend of each segment of the column through the three parts of the set is shown for both series combined. Figure 2 summarizes the data of both series in this manner. We see that the first segment of the column produced the highest rate of scoring in the set. The fourth segment was next in order, and the second segment in the column fell only a little below the level of the fourth. These three segments, the first, the fourth, and the second, show a general decline in average score level through the three columns of the set.

From the results of Figure 2, it is clear that the U-curve is not symmetrical, but that the lowest point in the curve is reached somewhere below the midpoint of the column. Thus the third segment not only failed to show the decline in the set which is a character-

[1] The figures used in the present investigation do not agree precisely with those reported by Reeves and Rhine, since the former report included 10 sets by incidental subjects which have been omitted from this study.

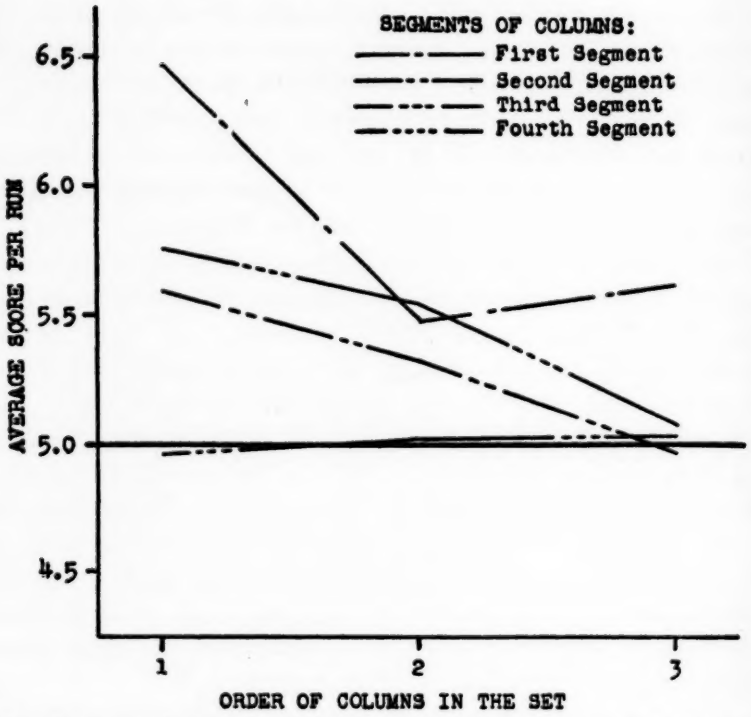

FIG. 2. Comparison of levels of scoring in the four segments of the column. The trend in score average for each segment is shown for the three columns of the set for the HD and the LD data combined.

istic of the other three, but also it failed to show any deviation of significance from chance expectation.

The fact has been mentioned that the first column of the set shows a greater degree of terminal salience than the other two columns. Indeed, when the data of this first column for the two series are combined, the evaluation of the T-M difference gives a CR of 4.20. This is highly significant and, in spite of the fact that only one-third as many trials are involved, it is only slightly below the CR of 4.38 for the T-M difference of all the data. This means that the psychological phenomenon of higher scoring in the beginning and ending trials of the column, which proves to be the form of the position effects in these records, is concentrated largely in the first column of the set. As the effort to throw further light upon this salience effect thus becomes the sole purpose of this study, it

will be advantageous and proper in the pages ahead to focus attention upon the *first column of the set.* And, as there is no longer any need to discuss the two series separately, this column will generally be considered for HD and LD combined.

The first column of the set as the point of emphasis in the data was selected when the analyses had been completed only up to the point presented thus far. The choice was made at that time, in advance of further exploration, in order to avoid the pitfall of selecting the methods of evaluation which would best fit the results after they were known.

Position on the Page

What is the connection between the terminal salience of the column and the position of the set on the page? We know already that the position effects are concentrated in the first column of the set, so the analysis needed to answer this question is one which shows the three *first columns* for the three set positions across the page. Figure 3 contains these results.

An effect of position on the page which is immediately evident from the graph is that the U-curve of salience is more marked in the first column of the first set on the page than it is in the first column

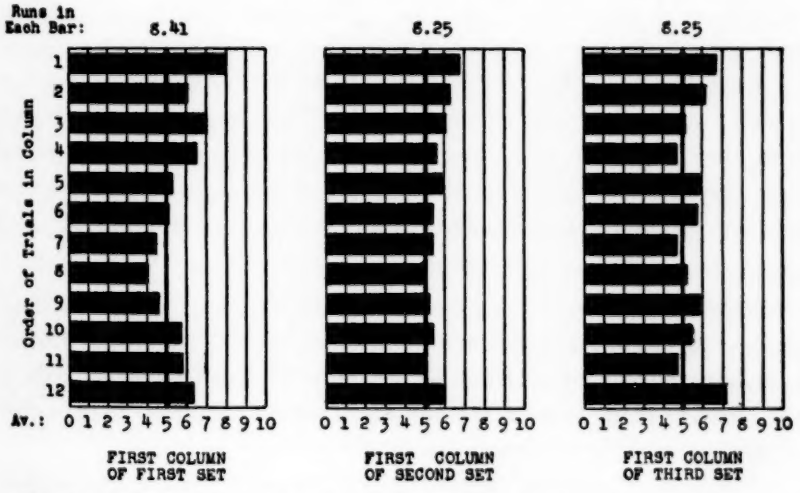

FIG. 3. Comparison of position effects in the first columns of the three sets across the page for the HD and the LD data combined.

of either of the other two sets. The evaluation of the difference between the T and M trials in each of these columns gives the following CR's for the three set positions across the page, respectively: 4.31, 1.47, and 1.47. Thus only in the first column of the first set on the page is the U-curve independently significant.

The question arises: Is the greater significance of these effects in the first column on the page actually a result of starting a new page? Or is it really a *session* effect which only accidentally has the appearance of being related to the page? In the Gibson Cup Series, where the start of each new page corresponded with the beginning of a new session, there was no way to distinguish between these two possible factors.

The test conditions in the present experiment fortunately permit us to decide this issue, for a single session sometimes extended through several pages for either the HD or the LD series. When the first column of first sets on the page *which marked the start of a new session* are grouped together and the degree of salience shown is compared with that found in the first column of first sets *which were continuations of sessions,* little difference in the degree of terminal salience is found, but the trend shown is toward more pronounced terminal salience in those first columns on the page which do not coincide with the start of a session. There are 34 such first columns which mark the beginning of a session, and the difference in average between the T and M trials is 1.18. In 67 first columns on the page which are continuations of sessions, the T trials average 1.61 higher than the M trials. This shows that the position on the page is the important factor. Whether the first set on the page is the start of a new session or the continuation of an old one does not matter.

Analysis for Chronological Effects

The calendar period covered by the experiment (June 9 to September 13, 1934) was divided at its midpoint. This resulted in an approximately equal division of the data, with a few more trials in the second group because the subject tended to increase her number of throws as the experiment neared the end.

Comparison of the composite sets for the two chronological halves of the series revealed no differences between them of any statistical significance. Whatever the psychological causes of these

effects may be, it appears that, within the limits of this particular experiment, there are no measurable effects which can be traced to the extent of the subject's experience in the situation.

Score Level Effects

The sets were divided into four groups in terms of the total scores obtained on the set, as follows: 18 and over; 16 and 17; 14 and 15; 13 and under. Mean chance expectation is 15. The position effects in the first columns of the sets in these four groups were then compared to see whether the salience effect is related to the general score level.

The conclusion has already been reached that the significant position effects in the data as a whole can be explained only on the PK hypothesis. Therefore this method of comparing them at different score levels should be informative in regard to their consistency from set to set.

We know that chance variations in total set scores will occur, regardless of whether the amount of terminal salience is constant or not. If, therefore, the high- and low-scoring sets show the characteristic position effects to the same degree, we have strong evidence that the subject was influencing the scores equally in the two groups.

On the other hand, if we find a difference in the distribution of hits between the two score levels, then we have evidence that the subject's effect on the scores from set to set was varying apart from the chance variation which must have been occurring at the same time.

The U-curves for the first columns of the sets of the four score-level groups are shown in Figure 4. The top curve is that for the highest score-level group, and the order from top to bottom corresponds, quite naturally, to the groups with descending set scores. No significance can be attached to the location of these curves on the vertical axis because of the arbitrary separation of data on the basis of levels of scoring success. The importance of the graph lies, rather, in the comparison of the shapes of the curves.

The significant finding here is that the U-curve is most marked when the score-level is highest and that it gradually diminishes as the scoring success drops. The degree of salience in these first columns may be stated in terms of the difference in average score per

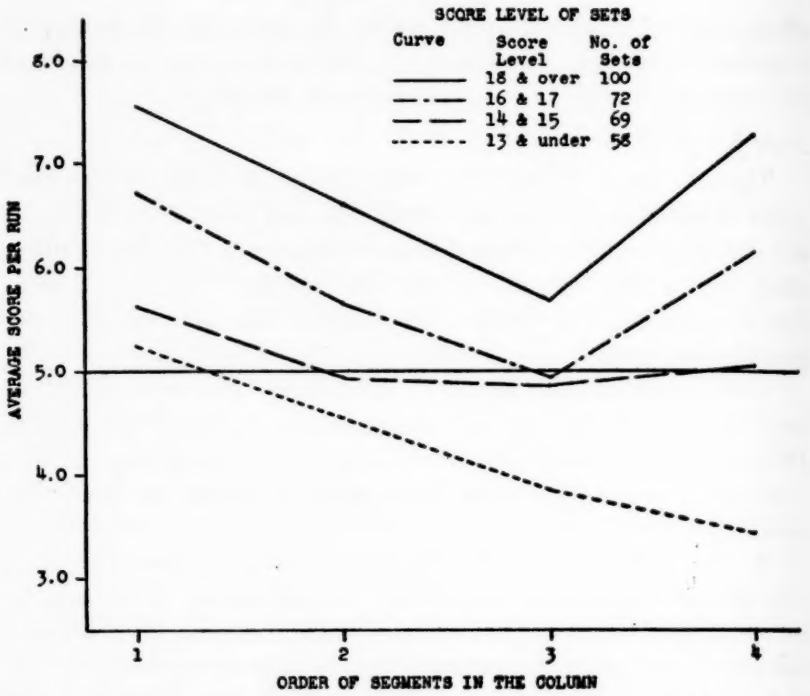

FIG. 4. Rate of scoring in the four segments of the first column of the set compared for four levels of scoring in the set.

run between the T and the M trials. The average T-M differences for these four curves, in descending order of set scores, are 1.28, 1.14, .43, and .14. The higher the set score, the more pronounced is the U-curve.

But this is not to say that the U-curve is flattened out uniformly as the scoring success drops. From Figure 4 we get a very strong suggestion that PK achieves a much more stable kind of performance at the beginning of the column than at the end. In fact, the level of scoring seems to have only a slight effect upon beginning salience, as there is about the same degree of decline between the first and second segments in all four groups. However, the degree of recovery in the last segment is directly related in these data to the general success of the subject in the set as a whole. The evidence points to an amount of variation in the subject's PK success which

was sufficient to be a factor in the total set score, so that the locus and form of the variation becomes evident when the sets are grouped according to score levels.

Discussion

The Present Findings Considered Alone

The outstanding feature of M.P.R.'s work, as presented in the Reeves and Rhine report, was the declines in scoring which were found: one between the upper and lower halves of the column; another in the three columns of the set; and a third one in the three sets across the page. The U-curve of column salience was also discovered, but no specific relationships between this characteristic of the results and the declines came to light through the analyses made at that time.

The method of studying position effects in terms of the smallest unit of the records, the individual trial, has revealed that the predominating factor in all the position effects in this series is the terminal salience of the column.[2] The three kinds of declines which were previously reported are largely to be explained in terms of systematic changes in the degree of terminal salience.

The vertical decline between the upper and lower halves of the run results from the fact that the U-curve is not symmetrical. When the column is divided into four equal segments, the highest average is found in the first segment. The fourth segment, which is next in order, is only slightly higher than the second one. The lowest point is reached in the third segment of the column. It is easy to see, therefore, how this unequal degree of terminal salience at the beginning and end of the column gives rise to a "decline in the column" when the upper and lower halves of the column are compared.

The horizontal decline within the set also seems to be explained in terms of the terminal salience of the three columns. The first column of the set shows a more pronounced U-curve than either of the other two. This could have come about as a result of either a decreasing rate of scoring in the end positions of the successive columns, or an increasing rate in the middle positions which made up

[2] More analyses in terms of the scoring success in individual trials were done in the course of this investigation than it is possible to present within the scope of this report. Students of the field who are interested in further information regarding these data are invited to correspond with the writer.

the low point of the curve, or both. The results summarized in Figure 2 show that the low point of scoring in the column, which was reached in the third segment, remained constant at the chance level throughout the three columns of the set. The difference in the total scores on the first, second, and third columns in the set therefore are the result of a decline in scoring in the terminal trials.

The horizontal decline in the three sets across the page is the result of the fact that the greatest amount of salience of the column is found in the first set on the page. The present investigation has revealed that there is a considerable drop in terminal salience in going from the first column of the first set to the first column of the second, but there is no change in going from the second set to the third one. This trend in salience follows closely the curve of total scores for the three sets. The drop in total score between the first and second sets gives a CR of 1.78, but there is no difference in average between the second and third sets.

The fact that all of the position effects in this series are traceable to systematic changes in the amount of terminal salience of the column does not, of course, detract from the psychological significance of these results. On the contrary, the importance of the findings is increased by the lawful manner in which this single feature in the records is related to the different parts of the test structure. We find the same pattern of decline, a higher level of success at the beginning of the natural units of the test, reflected in all three groupings of the records which have been studied: (1) In the individual column, the highest average was made in the first trials, although the recovery at the end gave rise to the U-curve of salience. (2) In the set as the unit, the most salience was found in the first column. (3) When the page itself was analyzed, the most significant scoring—which is, for this series, just another way of saying the greatest amount of terminal salience—was found in the first set on the page.

Comparison with Findings from Other Series

If this series were unique in these respects, there might be need for hesitation before concluding that the position effects presented in this paper represent psychological factors which have a general bearing upon how PK functions in other subjects and in other situations. But we know already that these findings are not unique.

There are many points of similarity between these results and the findings of earlier investigations, particularly those which were based upon the work of L.H.G. in the Gibson Cup Series.

The general characteristics of the position effects found in the records of these two subjects, L.H.G. and M.P.R., are much more nearly alike than we might at first suspect. This becomes evident when we base the comparison upon that part of L.H.G.'s work which was done without a witness to make the conditions of the two tests alike in this respect and when we take into account the difference in length of column employed in recording the results. L.H.G. used a six-trial column, just half as long as that adopted by M.P.R. The first column in the set in L.H.G.'s results gives a marked decline in scoring which corresponds to the decline given by M.P.R. in these same six trials. In other words, each subject produces the first half of the U-curve in the first six trials of the set.

But what about the up-swing in success which forms the second half of the U-curve? In the work of M.P.R. with the 12-trial column, this occurs in the second half of the same column. For L.H.G. with her six-place column, it occurred in the second column of the set. What is more, it continued to occur in each of the remaining columns of the set, being most marked in the tenth or final column. In fact, if the tenth column of L.H.G.'s composite unwitnessed set is mentally placed under the first one, the result is a column which is equal to M.P.R.'s in length and which has almost identical position effects. Anyone may verify this by referring to the graph of L.H.G.'s unwitnessed results in the December, 1946, issue of this JOURNAL, p. 249.

Not all 12-trial columns, however, have been found to give a U-curve. For example, in the Pratt-Woodruff PK Series, a decline was found which extended throughout the entire column. Further light upon the relation between position effects and length of column may result from the analysis of other series.

There is also a close similarity of position effects among the series which have been studied in regard to the influence of position on the page. In the present study, it was found that the most pronounced position effects occurred in the sets at the extreme left on the page, regardless of whether they were in the upper part of the

page (HD) or in the lower part (LD). Comparable page effects were found in the L.H.G. data, where the highly significant beginning salience of the first column of the left-hand sets was contrasted with the insignificant salience of the same trials in the right-hand sets. In this instance, however, the similarity is closer when L.H.G.'s witnessed work is considered. The page effects found in the Pratt-Woodruff study also offer an interesting comparison. In that series, the position effects took the form of a decline in scoring within the column. When the analysis was made for the position of the column on the page, the amount of decline was found to be greatest in the first column and to be progressively less through the other five column positions on the page. In other words, there was a progressive loss of success at the beginning of the column in going across the page.

Do position effects undergo any measurable change between the beginning and the end of an experimental series? As far as may be judged from the work of L.H.G. and of M.P.R., the answer is that they do not. Each subject showed the same, individual patterning of success in her test at the start of the series as at its finish. This finding suggests that the position effects are related to the subject's psychological make-up in some relatively stable and fundamental manner. These curves apparently have the same force and persistence for the individual as do other curves of performance, such as learning curves and memory curves. It appears that these effects, however distinctive they may be for any particular individual, are nevertheless fairly consistent with him over an extended period of time.

Finally, there is evidence from the work of both of these subjects, as well as from the Pratt-Woodruff PK Series, that the position effects are related to the general level of scoring in the set. The tendency for the U-curve of the first column of M.P.R.'s sets to fade away in those sets which gave average scores at and below the "chance" level has been described (see Figure 4). There was some loss of beginning salience of the column for these low-scoring sets; but especially did it appear that the ending salience of the column was affected when the subject made a low set score. In the work of L.H.G., the weakening of position effects in the sets with

low total scores was most plainly shown by the loss of salience of the first trial of the set in her witnessed work. However, there was some slight suggestion of a comparable effect in her unwitnessed work for both the beginning and the ending trials of the set. In the case of the Pratt-Woodruff series, one of the subjects showed the decline in the column, which was characteristic of that work, only in those columns which gave scores below "chance." This finding has a close similarity to the straight decline in the column of M.P.R. in data of a comparable score level.

It appears that there were general principles at work in the three experiments studied which influenced the results along the same general lines. At the same time, there are certainly many differences among these series which remain to be explained. To some extent, these dissimilarities may have come about as a result of variations in the manner in which the tests were structured. Almost certainly, however, they are in part reflections of individual personality differences among subjects, personal factors which affected PK performance.

Thus far, the findings of this study have been compared with those of earlier investigations by the writer in which similar methods of analysis were used. This does not, however, exhaust the possibilities of comparison between these results and those already reported, for there is in the literature a great amount of discussion of the psychological basis of position effects in both ESP and PK data. Higher scoring at the start of the column and recovery at the end have both been reported frequently. These findings, and others of a similar nature, from ESP tests were summarized by Rhine (**5**), who introduced the designation "terminal salience" into parapsychological literature. He found, in his own ESP researches on the problem, that runs interrupted after every fifth trial resulted in more significant scoring at the beginning and ending of the five-trial segments as well as in the beginning and ending segments of the run. Later Schmeidler (**8**) found that her "sheep" and "goats" gave distinctive curves of success through ESP runs of the same length, the usual 25 calls broken up into five segments. Both groups scored high in the first segment of the run, showing beginning salience or a primacy effect; but only the goats, who rejected the possi-

bility of the occurrence of ESP in the experimental situation, gave high scores again in the last segment, demonstrating a finality effect also and thus giving a U-curve for the column.

From the quarter distribution analyses of PK results, also, we have the discovery that the greatest number of hits was generally made in the first quarter of the set or page. This is, of course, simply an indication of the salience of these trials for the PK function. Rhine and Humphrey (**7**) related the QD effect to the size of the set. They compared sets which differed in terms of the number of dice thrown with the degree to which the QD distributions found were "typical." The results of this analysis indicated that the most typical QD's were given by sets which involved the smallest number of die throws, as if the number of faces to be observed and scored affected the subject's ability to structure the set as a whole. A similar finding was made in a series of tests by Schwartz (**6**). Sets with three different lengths of column were compared, and the most significant scoring was found in the shortest set. In this case, however, the significance of the smallest set was based upon a negative deviation, while the other two sizes compared gave positive deviations.

Concluding Remarks

The picture we get of the PK process from the detailed study of position effects is one of a real force in nature. But it is a force which shows up in the data only on the fringe of the test structure. Even in this fringe, the level of success attained by the best PK subjects tested thus far has been limited. The average rate of scoring in the most favorable trial positions does not equal as much as twice the mean chance expectation. There has been nothing in the PK tests to compare with the perfect runs and the highest averages obtained by the outstanding ESP subjects.

On the other hand, the major PK subjects, such as L.H.G. and M.P.R., have shown proportions of success in the *salient trials* of their dice-throwing tests as high as or higher than they achieved in their best ESP work. It is a well-known fact, also, that position effects occur in the ESP results as well. The important difference is that the evidence of many ESP experiments has established that subjects can and do overcome the handicap associated with the interior

trials of the record structure in applying that aspect of their psi capacities. This has yet to be demonstrated for PK tests.

This all adds up to the fact that the PK test as it has been developed and is in use today is a grossly inefficient instrument for measuring PK ability. By far the largest part of the test appears to be a sheer waste of time—or worse, since the failure of the subject to score above chance in these trials pulls down the average obtained in the few trials where PK does function. It almost seems that the test is choking off the very function which it was designed to measure.

With such a delicate balance between the conditions in the test which permit PK to function, however imperfectly, and those which inhibit it completely, it is easy to understand why the scientific discovery of this natural phenomenon has been so long delayed. Perhaps under the circumstances the chief cause for surprise is that the dice tests have met with any success at all in producing evidence for PK. The day may come when the original invention of the simple dice-throwing procedure as a means of testing PK will rank as one of the greatest of scientific discoveries.

In planning future PK tests, we may take steps to reap the benefit of our present knowledge of position effects. For example, both shorter columns, as used by Schwartz, to eliminate the unprofitable middle trials, and fewer columns in the set to avoid the sag in success after the first column are indicated. These are measures which can be taken in most instances without interference with the other, primary objectives of an experiment. They represent the attempt to short circuit the unprofitable areas of the test structure.

At the same time, a direct experimental inquiry is needed into the causal factors which are making those areas unprofitable ones for the PK process.

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Parapsychology Laboratory
Duke University
Durham, North Carolina

PHYSICAL OR NON-PHYSICAL?

By Robert A. McConnell[1]

In dealing with phenomena which we wish to classify as wiithin or external to the realm of physical science, defining criteria are of obvious importance. We would prefer that the criteria be chosen so as to be acceptable to the cosmologic physicist, to the parapsychologist, and to the everyday scientist whose knowledge of the nature of physics is generally a matter of faith and dogma.

In an initial attempt to separate the province of physics from that of non-physics we might classify phenomena according to three categories.

The first category would include phenomena explainable in terms of admittedly physical entities. The latter are not so numerous in kind but that they may be exhaustively classified in short order:

A. The force fields or modes of energy transfer are these:
   (1) Gravitational
   (2) Inertial (forces of acceleration)
   (3) Electromagnetic (static and quasi-static electric and magnetic fields, radio waves, light, x-rays, and gamma rays, which differ only in wavelength)
   (4) Atomic (high power forces effective at short distances)

B. The particles known to physics are these: protons, neutrons, electrons, positrons, mesons, neutrinos, as well as the heavier conglomerates: the atom and the molecule. Of these even the so-called elementary particles are not irreducible, but transform or combine, one with another.

Phenomena which are explainable in terms of the above quantities and their known inter-relationships may safely be classed as physical. To be so explainable constitutes a sufficient but not a necessary condition for physicality.

It should be borne in mind that we know very little about many of these quantities. Only recently we have been forced to revise our ideas of physical penetrability. It is now known that a neutrino would travel on the average clear through the earth many times before being stopped or deflected.

[1] Dr. McConnell is a physicist who has just completed his graduate work in physics at the University of Pittsburgh.—Ed.

It may be remarked, too, that phenomena falling in this first category are of little interest to parapsychology. So-called parapsychical phenomena have long been fully admitted to be beyond the present knowledge of physics.

The second category might include phenomena which fail to obey the "general laws" of physics. Among the latter we would list the rule that "action decreases with distance," and its more specific counterpart: "energy falls off inversely as the square of the distance from its source." We might be tempted to say that phenomena which fail to obey these laws are non-physical. Actually, such a point of view is wholly unjustified. One cannot say that such phenomena are *probably* non-physical. Certainly the physicist would not agree to such a statement.

The inverse-square law, for example, is an idealization whose exact applicability even with "inverse-square forces" is the exception rather than the rule. Nuclear forces, moreover, are known to vary according to other than an inverse-square law.

Even the broader law that action decreases with distance can be violated in the simple experiment in which the burning power of a sun-glass increases with distance both from the sun and from the glass up to the focal length of the glass. This might *seem* a trivial violation in view of our present deeper understanding of electromagnetic radiation. From the experimental viewpoint of science such seeming triviality is a common artifact of familiarity.

General physical laws of the above sort are very misleading. Perhaps one might safely say this much: their violation is suggestive of non-physicality.

In the third category we might place all phenomena which show an absence of any regular relationship (any law) expressible in space and time. Physics is concerned with space, time, and matter. (Since energy and mass are interconvertible, we shall for convenience speak of matter as including energy.) Specifically, physics is the expression of matter relationships in space-time coordinates. Thus, the absence of any regular relationship between experimental phenomena and space or time should, by definition, be proof of non-physicality.

Before settling back in comfort with our conclusion that here, at last, is a criterion sufficient to prove the non-physicality of psi

phenomena, we shall do well to examine the meaning of our words. How far has this manipulation of language taken us? The answer, as we shall see, is: not as far as we had hoped, but still further than we had any right to expect.

In the above categories we used the word *phenomena* when clearly we meant *relatable* phenomena. A single event, such as the fall of one apple at some place and time in history, can have no scientific usefulness to its observer when considered by itself. This event must be related to the fall of other apples and other objects before a scientific "explanation" can be said to exist. Thus, in setting up category No. 3, we have supposed that we can make two observations which we can know to be related but which exhibit no lawful time or space relationship. Does this make sense?

In the occurrence of two ordinary physical events our supposition is indeed without meaning. In the absence of correlation in space or in time we can have no way of identifying the first event with the second. We can have no knowledge of the existence of a mutual relationship.

However, where one of the observations is mental (e.g., the first event might be the contemplation of the second), then in general we can be justified in claiming a mutual identification. Here, clearly, is a fact of some importance: relationships which are wholly random in space and time must involve human thought as a logical condition for their existence.

We have just said something about relationships which are *wholly* random in space and time. Suppose that two ordinary physical events have only a weak correlation in space or time. Consider a series of possible relationships in which the correlation is successively weaker until a stage is reached wherein the correlation cannot be demonstrated in even a lifetime of experimentation.

This is a more practical supposition than we might at first believe. Before discussing it, perhaps we should bring explicitly into our consciousness the notion of causality, which we have in fact been using all along.

Causality is a much-fought-over idea. We shall adopt an admittedly unsophisticated approach to it as follows: mankind likes to believe that there is a cause for everything. Hence a first part to

the "principle of causality" is this: causal factors must exist. From long experience man has come to believe that the cause must occur before the effect. Hence, a second part to the principle of causality is this: the causal sequence shall not be violated. If we will make our observations at one point in the universe, such as the earth, then we can forget about problems of relativity and state simply that cause must precede effect if the causal sequence is to be preserved. Thus, in a fundamental sense causality is merely a restriction on the kinds of matter relationships in space-time.

It will occur to us that perhaps the violation of the principle of causality should be our criterion of non-physicality. This thought we shall pursue presently, but let us first return to the discussion of two physical observations which are only weakly correlated in space or time. This has to do with the first part of the principle of causality, the expectation that causal factors shall exist. (It will be convenient to assume for the present that we know what we mean when we use the term *causal factor.*)

If an orbital electron of an atom of neon gas is excited by a collision with an ion, that electron will remain in an excited state on the average of somewhat less than one-millionth of a second before returning to its normal state with the emission of a quantum of light. This happens repeatedly in neon advertising signs. The time delay involved is so small that for all practical purposes the observed result (light) may be said to be exactly correlated in time with its observed cause (our having thrown the light switch).

If an atom of sulphur is bombarded in a cyclotron so that a neutron enters its nucleus, the atom becomes excited, or radioactive, with a half-life of 88 days. Now the exact time which must elapse before this radioactive atom decays into an atom of chlorine with the emission of an electron is not known. Such decay is *wholly random.* It may be seconds or less. It may be years or more. On the average, among a lot of such radioactive atoms, one-half will decay within 88 days. Here we see that the observed result (the emitted electron) is only weakly correlated in time with its observed cause (our having turned on the cyclotron).

Suppose that we mine a sample of uranium ore. We observe the emission of a helium ion from our sample and conclude that an

atom of Uranium II has disintegrated. Did that disintegration have a cause? From the study of similar atoms we may infer that our atom had a half-life of one million years and that it must once have been an atom of Uranium X_2. Sometime—was it a second ago or was it one hundred million years ago?—the radioactive decay which we have just observed was "caused" by the radioactive conversion of an atom of Uranium X_2 to an atom of Uranium II.

What has happened to our notion that a causal factor must exist? It has lost much of its meaning. In a very real sense two experimental observations in the realm of physics can have an indefinitely weak causal relationship in time.

What about spatial relationships in physics? This is more difficult to discuss in terms of simple examples. However, we know from the Heisenberg uncertainty principle that observations of position cannot be indefinitely precise. We cannot observe, for example, just where an electron is within an atom. We can know only approximately where it is. To every possible region we can assign a probability for the electron's presence.

What is left of the possibility of classifying as surely non-physically related, any two observations which have no correlation in space or time? The difficulties in physics which we have just mentioned become appreciable only for sub-atomic observations. Perhaps the absence of space-time correlation on a macroscopic scale is still an adequate basis for identifying non-physical relationships. Perhaps at the sub-atomic level physics borders on parapsychology in some not-yet-understood sense, so that the distinction between them cannot be clear-cut.

Let us look now to the second part of the principle of causation: the cause must precede the effect. This raises a question of the meaning of *cause* and *effect*. We might note that violation of the causal sequence is hardly possible in physics. Of two repeatedly—and presumably causally—correlated events, that which occurs first is *defined* as the cause. If in physics two events occurred repeatedly but in random sequence, we would look for a third, earlier event as the cause of both. We would refrain from the use of the words *cause* and *effect* and would speak merely of *association*. We have

yet to recognize an experimental situation which would justify any other point of view.

Again, we find no such restriction on the relationship of two events, one of which is mental. A prediction of a future event may in many cases with some reason be called the result of that event rather than its cause. Here then is another facet of an earlier conclusion: events which violate the causal sequence must involve human thought as a condition necessary for proof of their causal relationship. The word *cause* has taken on an extended meaning which would be termed experimental nonsense by most physicists when dealing with two purely physical observations.

Let us consider another aspect of causal sequence. If two physical events occur at exactly the same time, how can we assign the terms, *cause* and *effect*? The instantaneous mathematical equations which we use to represent relationships in space-time do not explicitly distinguish between cause and effect. Moreover, in general, time can run backwards as well as forward in these equations. Our earlier consideration of a random time delay between cause and effect in atomic experiments tempts us to speculate as follows:

Perhaps the physical universe differs from our mathematical representation of it in that *all* effects are delayed in time by a random amount. Such a delay, however small, might be thought to determine for the observer the direction of time and to give sanction to his urge to speak generally of cause and effect.

Let us glance at one more problem which we shall discuss in terms of PK. Is PK a physical or non-physical phenomenon? To answer this question we might wish to show that no space-time relationships exist between cause (our will toward dice) and effect (the fall of the dice). However, the demonstration of the lack of these relationships must be exhaustive to be conclusive—a logically impossible task. On the other hand, there would appear to be a logical difficulty also in any attempt to show violation of causal sequence. If our wish follows the dice throw, is it PK or clairvoyance? This difficulty would seem to rule out for PK any positive test for non-physicality as we have defined that term.

In general it may not be possible to classify phenomena certainly as physical or non-physical. Perhaps it isn't important that we do

so. Be that as it may, let us review our tentative conclusions concerning the distinction between these classifications.

In physics two events must be correlated in time or space since there is no other way to recognized correlation. But this correlation is always of a random nature and becomes increasingly vague as we proceed to smaller and smaller phenomena. It is inherent in the physicist's point of view that the causal sequence cannot be violated in physics.

When human thought is involved, it becomes possible to recognize correlations without regard to space and time and to recognize causation which violates the causal sequence. What is more important, such correlation and causation have been experimentally shown to exist. To label these newly discovered activities as *non-physical* seems legitimate, but to call them *psycho-physical* would be more appropriate. Their failure to exist in physics is a necessary consequence of the form of physics and not a cause for surprise.

151 Center Avenue
Emsworth
Pittsburgh, Pennsylvania

PERSONALITY MEASUREMENTS AND ESP TESTS WITH CARDS AND DRAWINGS

By C. E. Stuart, Betty M. Humphrey, Burke M. Smith, and Elizabeth McMahan[1]

ABSTRACT: In the experiments reported here, college students were given two types of tests of extrasensory perception. In one they were asked to try to identify ESP cards, and in the other to make drawings resembling concealed pictures which had been cut from magazines. It had been found earlier by Dr. Humphrey that the manner in which drawings were made—entirely apart from their content—was related to the amount of extrasensory perception which the drawings showed in their likeness to the original pictures. When the drawings in the work described here were graded it was found that the students who had drawn "expansively" made high ESP scores on the drawings test and that those who had drawn "compressively" obtained ESP scores below the average expected by chance. This division of the subjects on the basis of the form quality in their drawings resulted in the most striking separation of high and low scorers yet made in ESP drawings tests, one clearly not attributable to chance.

It was thought that the form of the drawings might be used in the same way to pick out the high and low scorers in the ESP card tests made in the same session, but the analysis did not produce significant results. However, there was an interesting relation found between the two types of tests: when a subject scored high in the drawings test he tended to score low on the cards, and vice versa.—Ed.

Introduction

The varying degrees of success obtained in drawings tests of ESP were formerly a special source of perplexity to investigators in this field. In only a few series did the subjects show a reliable tendency to hit the intended targets, while in several there was striking evidence of displacement to the adjacent stimuli—either to the stimulus just before or just after the designated target. In addition to such differences in total results there were marked differences in the degrees of success obtained by individual subjects.

Recently, however, some of these heterogeneous results have fallen into a lawful pattern with the discovery of the relationship of ESP to the form quality of the responses (3). The *form* of a

[1] This manuscript had been outlined and written as far as the end of the Results Section when Dr. Stuart's death occurred. We had discussed with him in detail the form of the rest of the paper and have, to the best of our ability, incorporated his insights and suggestions into the later sections.—B.M.H., B.M.S., E.McM.

drawing—the way in which it was drawn rather than the subject matter—has seemed to reveal something about the mental state of the subject as he was drawing. When the form qualities of the drawing responses were studied, it was found that the quality of expansion-compression was in some degree associated with success in extrasensory perception as measured by the free response method (**9**). In the clairvoyance tests, subjects who drew expansive (free, uninhibited, imaginative) pictures made scores above mean chance expectation in their attempt to produce drawings resembling the target pictures. On the other hand, the subjects who drew compressive (fearful, timid, compulsive) pictures obtained scores below chance expectation.

The discovery of the usefulness of this criterion in ESP research with drawings suggested a study of its discriminative value in card tests of ESP as well. Such a study was carried out by Smith and Humphrey (**6**), who asked their subjects to make drawings and to do ESP card runs in the same session. In this research the drawings were obtained only for the purpose of securing expansion-compression ratings and they were not evaluated for evidence of ESP. The expansion-compression ratings did separate to a significant degree the high-scoring subjects from the low-scoring subjects in the ESP card tests.

The experimental work to be discussed in the present report was designed with a twofold purpose in mind: (1) to discover whether the expansion-compression criterion is equally discriminative of the results of ESP drawings tests and of ESP card tests given in the same session; and (2) to provide a pool of information relevant to many specific problems concerning ESP and personality by obtaining various personality test ratings from the subjects who had taken the ESP tests. It was hoped that a study of personality data from ESP subjects might reveal additional correlates of ESP and at the same time disclose any relationship that may exist between expansion-compression ratings and more stable personality characteristics.

This paper will deal with the results of the drawings and card tests as separated on the basis of only two personality measurements. The data concerning the relation of ESP to the other personality measurements obtained in connection with this experiment will be

presented separately in other reports surveying similar data from a number of series.

The Experiment

We are concerned in this study with two different experimental series, each consisting of both drawings and card tests of the clairvoyance type. In one series individual subjects were given both kinds of tests in the same session. In the other series students in the classroom situation were given similar tests as a group. The first series will be known as the Individual Series, while the second will be called the Group Series. The subjects in both series were students in a course in Psychology of Personality. Dr. Rhine was the instructor for the class of students who participated in the Individual Series. In the Group Series, two sections of students instructed by Mr. T. P. Malone and B.M.S. were merged for the tests given under B.M.S.'s direction.

The Individual Series

The subjects reported individually to the laboratory for the ESP tests during November and December, 1945. They were first given the card-calling tests by E.McM. and then they took the ESP drawings test under C.E.S.'s direction. As will be explained below, the personality questionnaires were given to the subjects at another time.

Card-Calling Tests. The subject was told that the test would be made with the BT procedure; that is, that the experimenter, without looking at the cards, would remove the first card from the deck and place it face-down in a shallow box while the subject made his guess. Then the second card would be laid on top of the first in the box until the subject made his second call, and so on through the deck. The subject was shown the experimenter's room which was approximately 50 feet down the hall and separated from the subject's room by two intervening rooms. It was also explained to him that contact between the two would be maintained by means of a signaling system.

After the instructions were completed, E.McM. shut the subject's door and returned to her room where she shuffled and cut the cards. Then she put the first card in the shallow box which

lay on the table before her, and pressed the signal key turning on lights both in her room and in the subject's room. At this "ready" signal the subject wrote down on his record sheet his impression of the symbol on the first card. He then pressed the key on his table and by so doing turned off the lights in both rooms. The experimenter placed the second card face-down on top of the first card, and pressed her key again to indicate that the next card was ready. The run proceeded in this manner until all 25 cards had been called. The experimenter then removed the cards from the box, carefully keeping them in the order in which they had been placed, and took them into the subject's room. Here she recorded the true card order on her record sheet and then compared it with the subject's calls.

At this point she casually asked the subject to make a drawing of anything on the blank letter-size paper provided. This request was made as if no great importance were attached to it and as if it were put in to fill in the time while the experimenter checked the hits on the first run. This was not an ESP test, but was inserted here to obtain a relatively "free" drawing for comparison with the drawings to be made later in an actual ESP test. The subject was not told this, of course, and he did not know he was to be asked to make ESP drawings later. In actual practice, however, the crowded schedule of appointments made it necessary to hurry the subjects in this task. E.McM. had to stop the drawing after two or three minutes in order not to get behind in her schedule. As will be pointed out later, this was unfortunate in that the time restriction seemed to result in compressive drawings in the majority of cases.

The subject was told the number of hits he had obtained on the first run and was given a word of encouragement. Three more runs were then made in the same manner, each being followed by a drawing.

At the end of four runs the subject was taken to another room for the ESP drawings test.

ESP Drawings Test. In the clairvoyance series which had formed the basis for the first expansion-compression study (3), the subjects had made drawings on paper clipped to the sealed envelopes containing the target pictures. Since that procedure had been successful, it was followed again here.

Because C.E.S. was to be the experimenter in these tests using the free response method, it was important that he should not know the nature of the target pictures in the envelopes. Accordingly, B.M.H. selected from her collection of pictures four which differed in form and subject matter. These she placed face-up in opaque manila mailing envelopes (size 9″ x 11″) which were then sealed with gummed tape. The envelopes were given to C.E.S. without any hint as to the subject matter of the targets enclosed. He lettered the envelopes "A," "B," "C," and "D," respectively, in the upper left-hand corners.

The subject was seated at a table in C.E.S.'s laboratory and was given one of the envelopes to which a blank sheet of letter-size paper was attached. He was instructed to orient his thoughts toward the picture within the envelope and to record his impressions on the paper which was directly over the picture. He was assured that the test was not one of drawing skill, but that the drawing merely served as a means for recording the salient ideas that came to him as he thought about the picture. He was allowed as much time as he pleased to do this. As a matter of possible interest, however, C.E.S. did record the amount of time elapsing between the first stroke the subject made and the point at which he indicated that he was finished. The subject was not told he was being timed for fear it might make him feel hurried.

When the subject indicated that he had drawn all he cared to for the first picture, he was handed another envelope and asked to do the same for it. This procedure was followed until the four enclosed pictures had been dealt with. At this time the subject was told that he would be notified of his results later on. The envelopes could not be opened to let each subject see the targets since the same pictures were to be used for all of the subjects in this series.

The order in which the sealed envelopes were presented to the various subjects was determined by a permutation table which C.E.S. had worked out so that each picture served as target in the first, second, third, and fourth positions in the session an equal number of times.

"Free" Drawings and Personality Tests. In addition to the clairvoyance drawings and drawings made between card runs, the stu-

dents were asked to make four "spontaneous" drawings at home when they felt relaxed and untroubled. These drawings were secured for the purpose of comparing the expansion-compression ratings of drawings made under different conditions. The results of this little study are presented separately in the Appendix.

The Maslow Security-Insecurity Test[2] and the Guilford-Martin Inventory of Factors G A M I N and S T D R C were given to these subjects in class. A few weeks after the individual tests had been completed, the subjects were asked to return to the laboratory to fill in the Stuart Interest Inventory (**10**). The results of both of these questionnaires will be reported separately in other papers.

The Group Series

Sixty-three students from a course in Psychology of Personality were tested by B.M.S. in one large classroom.

In brief, the test consisted of:

(a) two clairvoyance drawings
(b) two clairvoyance card runs
(c) two clairvoyance drawings

The pictures for the drawings tests were prepared by B.M.H. in exactly the same manner as were those for the Individual Series and were sealed before being turned over to B.M.S.

At the beginning of the session, envelope A was placed on the chalk rail in front of the group, and B.M.S. asked the subjects to make a drawing on the letter-size paper provided. He gave the same instructions as C.E.S. had given in the Individual Series, with the addition of a caution against borrowing ideas from their neighbors. It was not possible in the class-period tests to allow the subjects unlimited time for each response. After four or five minutes had elapsed, B.M.S. asked that the response sheets be labeled "A" and that those drawings which were finished be passed in. This request had the effect of hurrying up the slower subjects, although they were allowed to finish their drawings.

When all drawings had been collected and deposited in B.M.S.'s brief case, envelope B was set up in view of the subjects and the

[2] The writers gratefully acknowledge the permission of Dr. Maslow to mimeograph and to use his test in these research projects.

procedure repeated. Here the subjects labeled their response sheets "B."

After the drawings had been finished and collected, the two card runs were made. Each subject was given two record sheets stapled together with carbon paper between them. Each record sheet contained space for two card runs. Keeping the cards at all times behind an opaque screen, B.M.S. shuffled a deck of ESP cards and placed it face-down on the desk. He then rapped twice on the desk with a coin to indicate to the subjects that they should call the top card on the deck. The subjects recorded their choices in the first space on their record sheets. After five seconds, B.M.S. placed the first card, still face-down, in a separate pile and rapped again to indicate that the subjects were to make their call for the second card which was then on top of the deck. This procedure was continued until the run was completed. Then, being careful to keep the cards in order, B.M.S. returned the first deck to its box and took out the second deck of cards. The second run was done in the same manner as was the first. The subjects turned in the original copies of their calls and retained the carbon copies in order to be able to check their hits.

B.M.S. then opened envelopes A and B and showed the target pictures to the students. Next he recorded the true card orders for the two runs just completed, and then read them aloud while the students checked their hits on their carbon copies.

Envelope C was next placed on the chalk rail and the subjects were asked to draw their impressions in regard to the enclosed target picture. When all responses to "C" had been completed and collected, the same procedure was followed for envelope D.

At the end of the experiment, envelopes C and D were opened and the subjects were allowed to see the pictures.

The Maslow Security-Insecurity Test (Short Form) had already been given to these students in connection with a research project of Dr. H. Ansbacher. We are grateful to Dr. Ansbacher for providing us with these scores for our subjects.

Several weeks after the experiment, the Stuart Interest Inventory was given to the students in their respective classes. The results of this experiment will appear in a separate report by C.E.S.

Analyses

The two series were checked and analyzed in the same manner so that one description of these processes will suffice for both.

All of the clairvoyance drawings were turned over to B.M.H. who first judged the degree of expansion-compression in them according to the method described in detail elsewhere (**3**).

Each subject in the two series had made four clairvoyance drawings, which constitute a set for obtaining an ESP score by means of the preferential matching method (**9**). The identification marks on these drawings were cut off by B.M.H. and code numbers or letters substituted. This was done so that the judges who did the preferential matching would not know the name of the subject who drew each set nor the order in which the individual responses were made.

The target envelopes for the Individual Series were turned over to Mr. W. B. Scherer of the Parapsychology Laboratory, who opened each and recorded the number of the picture associated with envelopes A, B, C, and D, respectively. This record he kept secret until the preferential matching process had been finished by the judges.

The true order of the target pictures for the Group Series was recorded upon return of the material to the laboratory and it was also kept concealed from the judges until the matching had been completed.

The responses and targets in shuffled order were given to C.E.S. and E.McM. for preferential matching. This was true for both series. In addition, C.E.S. also rated all the drawings for expansion-compression.

The matching records for the Individual Series were then turned over to Dr. J. G. Pratt. He obtained the actual order of the stimuli from Mr. Scherer and the order of the responses from B.M.H. From these lists he checked the true correspondences. The judges' records for the Group Series were checked in a like manner by B.M.H. (Assistants in the laboratory rechecked both series.) From the judges' records the ESP score for each set of drawings was determined.

The expansion-compression score for each set consists of the average of the scores assigned by C.E.S. and B.M.H.

The ESP card runs have been checked and rechecked by members of the staff or by assistants in the Parapsychology Laboratory. All computations of both drawings and card results have been independently checked at least twice.

All drawings results have been evaluated by the "Student's" *t*-test and probabilities have been obtained from the table of "Student's" *t*-distribution.

Ideally, it would be best to evaluate the card runs by this same method; however, since the card runs were not significant by the usual method of obtaining the CR of the difference based on theoretical variance, there was no need to perform the more complex operations involved in obtaining the "Student's" *t*.

Results

Results of Clairvoyance Drawings Tests

General Results. The total results for the two series of clairvoyance drawings tests are presented below (mean score expected by chance is 40.00):

Series	Number of Subjects	Deviation	Mean Score
Individual.....	33	− 9	39.73
Group.....	63	+31	40.49

None of the results in the clairvoyance drawings tests were significant. Of the two series, the one consisting of the group tests gave the larger deviation.

In the article on the previous clairvoyance drawings series (8), Stuart reported that his subjects had given evidence of significant backward displacement; that is, they tended to hit, not the target picture aimed at, but the one which had been presented just previously in the session. Since in the present series we used the same technique as had been used in the Stuart series, it seemed appropriate to analyze these data for backward displacement effects.

The results of this analysis for displacement are given below where it may be seen that both series gave virtually chance results:

Series	Number of Subjects	Deviation	Mean Score	*t*
Individual.....	33	−18	29.45	.51
Group.....	63	+33	20.52	.95

(The mean chance score for the Individual Series is 30.00. Because the first two stimulus pictures in the Group Series were shown to the subjects after the second trial, displacement can be measured for only two stimuli—Response 2 to Stimulus 1, and Response 4 to Stimulus 3. Thus the mean chance score for the Group Series is 20.00.)

Individually or combined, these two series show no evidence of displacement to the just-previous stimulus.

Results in Relation to Expansion-Compression. The ESP scores obtained by the preferential matching method were added together for all the expansive subjects and the total score was evaluated. Those for the compressive subjects were similarly treated. The results for each group in both series are presented in Table 1.

Table 1

CLAIRVOYANCE DRAWINGS RESULTS AS DIVIDED BY THE EXPANSION-COMPRESSION CRITERION

Series	Expansive Subjects			Compressive Subjects			t_d
	No.	Dev.	Mean Score*	No.	Dev.	Mean Score*	
Individual	13	+ 27	42.08	19	− 42	37.79	1.73
Group	23	+ 91	43.96	40	− 60	38.50	3.09
Total	36	+118	43.28	59	−102	38.27	3.51

* Mean chance expectation is 40.00.

The t of the difference between the means of the two groups is 3.51, which is highly significant with a probability of .00023 (93 degrees of freedom). The total results for the 36 expansive subjects were significantly positive with a t of 2.82. The 59 compressive subjects, on the other hand, gave results below chance expectation, the t of the negative deviation being 2.01.

Both series follow the same trend. The Group Series is independently significant in terms of the t of the difference between the means of the expansive and compressive subjects ($t_d = 3.09$). In the Group Series the total ESP score for the expansive group alone is also significant ($t = 2.54$; d.f. $= 22$). Although the Individual

Series is not independently significant, it compares quite favorably with the results of any of the four individual clairvoyance series upon which the first expansion-compression study was based.

In that first expansion-compression study, the compressive subjects had given striking evidence of backward displacement. When the scores for displacement to the just-previous stimulus were compiled for the two series in this report, the following results were found (mean chance score for the Individual Series is 30.00, while that for the Group Series is 20.00):

Series	Expansive Subjects			Compressive Subjects		
	N	Dev.	Mean Score	N	Dev.	Mean Score
Individual.....	13	+13	31.00	19	−23	28.79
Group.....	23	−23	19.00	40	+56	21.40

The results of this analysis are not significant. The Individual Series does not show the same trend as that found in the earlier study. In the Group Series, however, the compressive subjects did obtain a mean score above "chance" ($t = 2.28$), while the mean score of the expansive subjects is below the mean chance score. The difference between the two groups has a t of 1.99, which is not significant.

Before going on to other results, it may be of interest to record the coefficients of correlation between the expansion-compression ratings which C.E.S. and B.M.H. gave to the individual subjects. Inasmuch as these judgments necessarily involve subjective decisions, it is important to see to what extent independent judgments of such material agree. The statistics for the two series are summarized below:

Series	Number of Cases	r	P
Individual.....	32	+.67	< .01
Group.....	63	+.77	< .01

Each of these coefficients is significant, and they are of an unusually high order for this type of material. They compare quite favorably with a previous report (**6**) wherein the coefficients for these same judges ranged from +.50 to +.75.

Results in Relation to Security-Insecurity Ratings. The subjects in the Individual Series were given the full form of the Maslow Security-Insecurity Test of 75 questions, while those in the Group Series were given the short form of the test consisting of the first 25 questions.[3] The subjects who obtained scores above the mean[4] for each form of the test were arbitrarily classed as "secure," while those with scores below the mean were classed as "insecure."

Table 2 presents the ESP drawings results for the secure and insecure subjects in each series. The insecure subjects obtained a mean score above that expected by chance, while the secure subjects scored below mean chance expectation. The difference between the two groups is not significant.

Table 2

CLAIRVOYANCE DRAWINGS RESULTS AS DIVIDED BY SECURITY-INSECURITY RATINGS

Series	SECURE SUBJECTS			INSECURE SUBJECTS		
	N	Dev.	Mean Score*	N	Dev.	Mean Score*
Individual.....	13	+ 7	40.54	17	+ 4	40.24
Group.....	28	−31	38.89	30	+57	41.90
Total.....	41	−24	39.42	47	+61	41.30

* Mean score expected by chance is 40.00.

The trend shown in the table is just opposite to that shown in the ESP card-run results as separated by this test in the report of Smith and Humphrey (**6**).

Examination of the results of the two series separately shows that the trend is due to the Group Series.

Expansion-Compression Combined with Security-Insecurity. In the previous report (**6**) a combination of the two personality measures resulted in an even more effective separation of high and low scorers in ESP card tests than either measure accomplished alone.

[3] According to Maslow's analyses of the results of this questionnaire (**4**), the short form of the test correlates very well with the complete test ($r = +.92$).

[4] The mean for the complete form of the test was that published by Maslow (**4**), while the mean used for the short form was that computed by Dr. Ansbacher on the basis of approximately 400 questionnaires given to his students.

In doing the same type of analysis for the Individual and Group series, we obtained the ESP scores for the following groupings of subjects: (1) those who were expansive and secure; (2) those who were expansive and insecure; (3) those who were compressive and secure; and (4) those who were compressive and insecure.

Table 3 presents the results of the clairvoyance drawings tests for these groups of subjects. (Mean chance expectation in each case is 40.00.)

Table 3

CLAIRVOYANCE DRAWINGS RESULTS AS DIVIDED BY A COMBINATION OF EXPANSION-COMPRESSION AND SECURITY-INSECURITY RATINGS

Series	Expansive-Secure Subjects			Series	Expansive-Insecure Subjects		
	N	Dev.	Mean Score		N	Dev.	Mean Score
Individual....	6	+27	44.50	Individual...	5	+ 7	41.40
Group.....	9	+32	43.56	Group.....	13	+58	44.46
Total.....	15	+59	43.93	Total....	18	+65	43.61
Series	**Compressive-Secure Subjects**			**Series**	**Compressive-Insecure Subjects**		
	N	Dev.	Mean Score		N	Dev.	Mean Score
Individual....	7	−20	37.14	Individual...	11	− 9	39.18
Group.....	19	−63	36.68	Group.....	17	− 1	39.94
Total.....	26	−83	36.81	Total....	28	−10	39.64

Expansive-Secure vs. Compressive-Secure Subjects:.....t_d =3.80
Expansive-Insecure vs. Compressive-Secure Subjects:.....t_d =3.18
Expansive-Secure vs. Compressive-Insecure Subjects:.....t_d =2.09
Expansive-Insecure vs. Compressive-Insecure Subjects:...t_d =1.77

The greatest difference between groups is that between the results of the expansive-secure subjects and those of the compressive-secure subjects. The probability associated with this difference alone is .0007.

In the Smith-Humphrey card results, the greatest difference was found between the expansive-secure subjects and the compressive-

insecure subjects. Here the expansive-secure subjects still achieved the highest results, but the compressive-secure subjects obtained the lowest.

Results of Card Tests

There were 258 runs in the card tests with a total deviation of +6, which is not significant. The results for the two series separately were as follows:

Series	Number of Subjects	Runs	Deviation	Average Score	CR
Individual.....	33	132	−3	4.98	.13
Group.....	63	126	+9	5.07	.40

In the report of Smith and Humphrey the separation of high and low scorers in ESP card tests was made on the basis of the form quality in the clairvoyance drawings made by the subjects in the same session. In view of those findings it seems reasonable to suppose that the form quality of drawings made in an ESP test would bear more relationship to ESP card results than would the form of drawings made without reference to an ESP target. Therefore, in regard to the Individual Series, we considered the division of the card runs on the basis of the form quality of the clairvoyance drawings. (The results of the BT runs as divided by the expansion-compression ratings of the other two types of drawings made by these subjects are presented in the Appendix.)

The separation of the card run results in terms of expansion-compression is presented below for the two series separately:

Series	Expansive Subjects				Compressive Subjects			
	N	Runs	Dev.	Av. Score	N	Runs	Dev.	Av. Score
Individual.	13	52	+16	5.31	19	76	−18	4.76
Group.....	23	46	− 3	4.94	40	80	+12	5.15
Total..	36	98	+13	5.13	59	156	− 6	4.96

In the Individual Series, the trend follows that of the previously reported series: the expansive subjects scored above chance expecta-

tion while the compressives obtained a negative deviation. The difference between the two groups is not significant ($CR_d = 1.5$).

The trend shown by the Group Series is opposite to that expected and the difference between the groups of subjects is not significant.

The expansion-compression ratings on the clairvoyance drawings have thus not separated the high-scoring and low-scoring subjects in the ESP card tests made in the same session.

The card runs were also studied in relation to the security-insecurity ratings of the subjects. When the results for the secure subjects were separated from those of the insecure subjects, the figures shown below were found:

Series	Secure Subjects				Insecure Subjects			
	N	Runs	Dev.	Av. Score	N	Runs	Dev.	Av. Score
Individual.	13	52	+11	5.21	16	64	−11	4.83
Group....	28	56	− 3	4.95	30	60	− 1	4.98
Total..	41	108	+ 8	5.07	46	124	−12	4.90

The average run score of the secure subjects is above mean chance expectation and that of the insecure subjects is below "chance," but the difference is very small. All that can be said about these results is that in a very small way they reflect the trend reported by Smith and Humphrey.

When the security-insecurity ratings were combined with the expansion-compression ratings, as was done for the drawings results, the card run results were distributed as follows for the four different groups of subjects:

Subjects	Number	Runs	Deviation	Av. Score
Expansive-Secure.....	15	42	+ 7	5.17
Expansive-Insecure.....	18	46	+10	5.22
Compressive-Secure.....	26	66	+ 1	5.02
Compressive-Insecure.....	28	78	−22	4.72

None of the differences are significant. The trends shown do not agree with those of the drawings tests; the highest average score

in the card runs was obtained by the expansive-insecure subjects, while the lowest average was that of the compressive-insecure subjects.

Discussion

Counterhypotheses

The most significant finding from these two series was the fact that the expansion-compression criterion separated the high and low scorers in the drawings test. The difference between the ESP scores of the two groups of subjects has a probability of .00023. Thus, the hypothesis that this result is due to chance is not applicable.

In group tests, however, it is possible that, from several sources of influence other than ESP, a number of subjects may be led to make similar drawings. If subjects have similar backgrounds and interests, if they copy from one another, or if they respond similarly to some outside event, such as the ringing of a church bell, their drawings will have a similarity which is not due to ESP. The evaluation of drawings results depends upon the assumption that a given subject's responses are independent of the responses of the other subjects. In the case where such independence of responses does not hold, the chance mean would remain the same, but the true variance would be larger than the estimated variance, and the resulting t would be spuriously high.

The hypothesis of spurious similarity of responses is not applicable to the Individual Series, where each subject was tested alone and where the order of target pictures was systematically permuted. However, in the Group Series, where a number of responses were made to a single stimulus picture, it is necessary to consider the possibility that some factor or factors other than ESP may have led the subjects to make similar responses on the various trials.

The first source of similarity—that of common background and interests—may lead subjects to draw certain objects as their first response, certain other objects as their second, etc. For example, if a large number of dog lovers were tested as a group, it is quite possible that many subjects would draw dogs as their first response. As Stuart (7) has pointed out, however, one would logically expect

such an effect to operate most strikingly on the first response. On subsequent trials, the subjects would tend to differ more and more in their response topics. The hypothesis that the subjects drew similar responses because of similar interests becomes unlikely in reference to the Group Series, since, as will be shown below, the rate of scoring on the first trial was below chance expectation, while that on the fourth trial was significantly above chance expectation.

The other two sources of spurious similarity—copying and suggestion of response topics by an external event—would be difficult to rule out in interpreting significant total results for such a series as the Group Series. However, in this series we are not concerned with the significance of total results, but rather with a significant difference between two groups of subjects, expansives and compressives. For this difference to be due to some spurious response similarity one would have to suppose that the influences producing such similarity are grouped along personality lines, that one type of subject was more susceptible to outside influences than the other. In order to meet this counterhypothesis, it is necessary to present some additional facts from the Group Series.

The four target pictures in the Group Series differed rather strikingly in the degree of success obtained on each. In terms of the matching in which each stimulus is ranked with respect to the four responses,[5] the mean scores for each of the four stimuli are given in Table 4. The first stimulus has a mean score which is significantly below the mean chance score of 5.00 (t = 3.63; d.f. = 62). The mean score of the fourth stimulus is significantly above the chance mean with a t of 4.49 (d.f. = 62). That these data provide an adequate sample of the total results is shown by the fact that the difference between the ESP scores of the expansive and

[5] In the preferential matching process, the judge has two tasks: (1) he ranks each of the responses with respect to the degree to which they resemble the four stimulus pictures; and (2) he ranks each of the stimuli with respect to the four responses. In the first task, because of certain preferences on the part of the judge, *each* response may be ranked first with a certain stimulus. For example, a judge may see more similarity between each of the responses and a certain target picture because it is more complex (and therefore contains more items capable of being associated with the responses), or because he has a certain preference for a given stimulus which blinds him to references to the other stimuli. In the second task, however, the judge is forced to give weights of 4, 3, 2, and 1 to each stimulus. Thus in this matching task, the scores are free from judges' preferences and they provide the best basis for comparing stimuli.

compressive subjects for this section of the data alone is significant with a t_d of 3.20 (d.f. = 61).

Table 4

MEAN SCORES* FOR THE FOUR STIMULI IN THE GROUP SERIES

Subjects	N	Stimulus 1 Train	Stimulus 2 Party	Stimulus 3 Barnyard	Stimulus 4 Church
Expansives.....	23	4.87	5.52	5.52	6.48
Compressives....	40	3.85	4.80	4.70	5.78
Total.....	63	4.22	5.06	5.00	6.03

* The mean score expected by chance is 5.00.

It is very difficult to explain in terms other than ESP *both* the significant difference between the expansive and compressive subjects and the significant results on the two stimuli mentioned above. One might postulate that the significant difference is due to the tendency on the part of one group of subjects to respond to external stimuli and to a tendency for the other to reject such suggestions from outside. The total results of the expansive subjects are significantly above chance expectation. Therefore, we might assume that they are due to the fact that the expansive subjects may have responded to external stimuli which happened to coincide with the topics of the target pictures. If we do so, we would have difficulty in explaining, in terms other than ESP, the fact that the compressive subjects obtained significantly negative results on the first trial and significantly positive results on the fourth.

On the other hand, we may reverse this line of reasoning and suppose that the compressive subjects are more suggestible. In this case the negative deviation on the first trial could be explained by supposing that some outside event occurred, such as the barking of a dog, which caused the compressive subjects to make drawings quite unlike the Train stimulus. Similarly, the positive deviation on the fourth trial might be explained by supposing that the presentation of the fourth target picture, the Church, coincided with a relevant external event, such as the ringing of a church bell. On the basis of such logic we could account for the results of the compressive subjects, but not for those of the expansives.

If we attribute greater susceptibility to outside influences to either group of subjects, we are still confronted with the fact that at least a part of the data cannot be reasonably explained except in terms of ESP.

The plausibility of such a counterhypothesis is further reduced by the fact that four previously reported clairvoyance series (8) to which such hypotheses are not applicable showed similar differences between the ESP scores of expansive and compressive subjects.

Thus, in view of these facts, ESP seems to be the best explanation of the results of the drawings tests in the two series.

Position Effects in Drawings Data

Since the results given in Table 4 do not seem to be explainable except in terms of ESP, let us consider them as possible evidence of position effects and compare the results of the Group Series with those of the Individual Series.

In the Group Series there was an improvement of performance from the first to the fourth trial. The t of the difference between the results obtained on the first stimulus and those on the fourth is 5.73 (d.f. = 61), which has a tabulated probability of less than .000,000,02.

When the results are compiled for the four trials of each subject[6] in the Individual Series, the following mean scores were obtained (mean chance expectation is 10):

Subjects	N	Stimulus 1	Stimulus 2	Stimulus 3	Stimulus 4
Expansives.....	13	8.85	10.85	10.92	11.46
Compressives....	19	8.74	10.11	9.68	9.26
Total.....	33	8.82	10.55	10.36	10.00

None of the means are significantly different from the chance mean, although the mean of the first stimulus has a t of 1.98. In this series, also, the mean of the first stimulus is below "chance," while the means of the other three stimuli are above or at "chance."

[6] In the clairvoyance drawings test one subject recorded her impressions in words instead of drawing. Therefore her responses could not be rated as to form quality, but her results are included in the total results here.

There is not the marked improvement on the fourth trial here, however, such as was shown in the Group Series.

If the two series are combined by the chi-square method, the difference between the first and fourth trials is of course highly significant ($P < .000,000,1$), mainly because of the contribution of the Group Series.

In the Group Series, both the expansive and compressive subjects showed the trend toward improvement of performance through the session, while in the Individual Series only the expansive subjects showed an incline.

Position Effects in the Card Runs

In the Group Series, the subjects each made two card runs, while in the Individual Series, four runs were made by each subject. The results for the different successive runs in each series are given in Table 5.

The position effects of these card runs seem to parallel those of the drawings tests. In both series, the lowest average score for the

Table 5

AVERAGE SCORES FOR SUCCESSIVE RUNS IN ESP CARD TESTS

Subjects	INDIVIDUAL SERIES					GROUP SERIES		
	N	Run 1	Run 2	Run 3	Run 4	N	Run 1	Run 2
Expansives....	13	4.69	5.77	4.77	6.00	23	4.44	5.44
Compressives..	19	4.63	5.11	4.68	4.63	40	4.88	5.43
Total*....	33	4.67	5.45	4.70	5.09	63	4.71	5.43

* See footnote 6.

card runs occurred on the first run. As in the drawings tests, both expansive and compressive subjects showed an incline in the Group Series, while only the expansive subjects improved in the Individual Series. None of the card-run differences are significant.

General Comments

The principal finding of these series is the confirmation of the utility of the expansion-compression criterion in separating the high and low scorers in ESP drawings tests. For the two experiments

reported here, the *t* of the difference between the ESP scores of the expansive and compressive subjects was even more significant than that of the first report on the use of the form criterion (3). In that first report, based on the results of 96 subjects, the *t* of the difference was 3.00, while in the present report, based on the results of 95 subjects, the *t* of the difference was 3.51. Moreover, the expansion-compression ratings in the two series of this report are composed of the averages of the ratings of two independent judges, while in the first report, the drawings were rated by one judge only. Thus in the series where presumably a more reliable estimate of expansion-compression (average of two judges' ratings) was used, the difference in mean scores for the two groups was even greater.

The card runs in both of these series, however, showed no results of significance by any evaluation. They failed to confirm the results of three previous card-run series reported by Smith and Humphrey (6), in which the expansion-compression criterion separated high and low scorers. In the Individual Series the card run results for the two groups of subjects were in the expected direction although the difference was not significant. It is possible that the failure in this instance may have been due to the conditions under which the series was carried out. The drawings made in the card test session were not drawings aimed at an ESP target. Moreover, they were made under rushed conditions. Although the same subjects did make drawings in an ESP situation later, the conditions were different and the experimenter was different so that we should perhaps not be surprised at the fact that the form quality of the ESP drawings did not separate the ESP card results obtained earlier with another experimenter.

The card-run results in the Group Series, however, cannot be explained in terms of difference in the card-test situation and drawings-test situation. Both types of test were carried out in the same session with the same experimenter, the card tests coming in the middle of the drawings tests. In an attempt to understand the difference in card and drawings results, C.E.S. suggested that some sort of a "drainage effect" may occur when two or more different types of ESP tests are presented in the same session; that is, when subjects are asked to do two different tasks, they may concentrate

their attention and interest on one to the exclusion or even to the detriment of the other. As a test of this hypothesis, subjects whose scores on the drawings test were above the chance mean were separated into two groups: those who scored above chance expectation in the card tests and those who scored at or below "chance" in the card tests. Similarly the subjects whose scores on the drawings were at or below mean chance expectation were divided into two groups depending upon the scores they obtained in the card tests. From the number of cases in each category, the following fourfold table was constructed:

Drawings Scores	Card Scores +	Card Scores 0 or−	Total
+	8 (a)	23 (b)	31
0 or−	19 (c)	13 (d)	32
Total	27	36	63

The majority of the cases fall in the diagonal cells *b* and *c*; that is, the number of subjects who do well at one test and poorly at the other far outweighs the number of subjects who obtain similar scores on both types of test. Only 21 subjects obtained deviations of the same sign on both tests, while 42 subjects obtained a positive deviation on one test and a negative or zero deviation on the other.

In order to find the probability of the independence of the two measures of ESP, a chi-square test was made on the material from the fourfold table.[7] The probability found was slightly less than .02. This figure suggests that there is a degree of dependence—that is, that high scores on one test are more likely to be associated with low scores on the other.

An additional measure of the relationship between the scores on two ESP tests is afforded by the tetrachoric correlation statistic (**1, 5**). In order to discover the degree of relationship between the two variables, Thurstone's computing diagrams (**1**) were used for determining the tetrachoric correlation coefficient. For the 63 cases

[7] Yates's correction for small numbers of cases has entered into this computation.

in the Group Series, the coefficient was −.50 with a standard deviation[8] of .199. Although there is some uncertainty in mathematical circles concerning the determination of the significance of a tetrachoric correlation (especially when the number of cases is less than 100), the probability associated with the negative correlation found appears to be at least no greater than the .05 level (2).

This suggestion of a negative relationship between ESP card scores and ESP drawings scores led to a further analysis of the data to determine whether such a result might have been due to one or the other of the two groups of subjects, expansives and compressives. Construction of separate fourfold tables for the two groups revealed that the negative correlation was contributed wholly by the compressive subjects. The fourfold table for the compressives alone is shown below:

Drawings Scores	Card Scores: +	Card Scores: 0 or −	Total
+	3	13	16
0 or −	15	9	24
Total	18	22	40

The chi-square test for the compressives alone gave a probability of less than .02, while the tetrachoric correlation coefficient was −.65, with a standard deviation[9] of .252. This coefficient appears to have a probability of somewhat less than .05. The expansive subjects showed only a negligible trace of a tendency in the same direction.

The fact that the compressive subjects obtained a mean score below mean chance expectation on the drawings might lead one to expect, in view of the large negative correlation, that the compressives should have obtained a mean score well above "chance" on the card runs. Actually, although the total deviation of the compressives was below chance expectation ($t = 2.01$), 40% of the com-

[8] This standard deviation was computed on the assumption that the true population correlation was actually zero.

[9] This standard deviation was computed on the assumption that the true correlation was actually zero.

pressives obtained individual scores above "chance" in the drawings test. Of the 40% who obtained positive scores on the drawings, 81% made negative scores on the card runs. On the other hand, 60% of the subjects made individual scores below "chance" in the drawings tests, and of these, 62½% obtained positive scores on the card tests.

Thus the compressives as a group do not seem to prefer a specific test procedure, but individually they show a differential preference; that is, some obtain positive results at drawings and negative results at cards, while others obtain positive results at cards and negative results at drawings.

It is too early to be able to say exactly what the importance or significance of this finding may be. It is conceivable that it was an effect produced by some specific conditions in the situation and that it will not be found generally. It is not found in a subsequent analysis of the Individual Series, where card tests and drawings tests were given to the subjects by different experimenters under different conditions. A similar analysis of a later group experiment which is awaiting publication only partially confirmed the results of the Group Series. It is not possible yet to distinguish the subtle differences in conditions that may have produced these differing results.

This is the first experiment in which Maslow's Security-Insecurity Test has been given to subjects who had taken ESP drawings tests. The only previous use of this personality questionnaire in conjunction with ESP tests was that reported by Smith and Humphrey in regard to ESP card tests. The trend shown in their ESP card tests was not borne out in the ESP drawings tests of the present series. Here, the greatest difference was found between the ESP scores of the expansive-secure subjects and those of the compressive-secure subjects ($t_d = 3.80$). These and the other results of the combination of the two personality measures seem to indicate that the differences found are due primarily to the effectiveness of the expansion-compression criterion and that the Security-Insecurity Test did not discriminate between high and low scorers in the ESP drawings tests.

Incidental Observations

During the drawings tests in the Individual Series, C.E.S. recorded the length of time it took each subject to make his response drawings. The total drawing times ranged from 4 minutes, 15 seconds to 50 minutes, 10 seconds. The subjects were arranged in order in terms of the amount of time they consumed in making their drawings and the median was determined.[10] The subjects who fell above the 50% line, indicating that they spent little time in drawing, obtained ESP scores on the drawings which were above "chance," while the subjects who took longer in making their drawings made ESP scores below chance expectation. These figures are given in Table 6 along with the figures for the expansive and compressive subjects separately. (Mean chance expectation is 40.00 in each instance.)

Table 6

DRAWINGS RESULTS FOR SUBJECTS SEPARATED ON THE BASIS OF DRAWING TIME AND EXPANSION-COMPRESSION RATING

Drawing Time	EXPANSIVE SUBJECTS		COMPRESSIVE SUBJECTS		TOTAL	
	N	Mean Score	N	Mean Score	N*	Mean Score
"Fast" (4-15 minutes).....	5	43.60	9	39.33	15	41.20
"Slow" (15.33-60 minutes) ..	6	41.33	10	36.40	16	38.25

* One subject in the "fast" group could not be rated for expansion-compression, but her score is included in the total for the "fast" group.

The table shows that the "fast" expansive subjects obtained higher scores than did the "slow" expansives. Similarly, the mean score of the "fast" compressive group is higher than that of the "slow" compressives. The greatest difference in scoring was between the "fast" expansive subjects and the "slow" compressives, the t of this difference being 2.05. This difference is much larger than that between the scores as divided by the expansion-compression criterion alone ($t_d = 1.73$).

[10] Two subjects had drawing times which came exactly at the median and they were excluded from this analysis.

In addition to noting the total drawing time taken by each subject, C.E.S. also recorded his impressions regarding the rapidity with which the subjects began their assigned task. (These impressions are of course independent of the subjects' ESP scores which were not determined until a month or so later.) It was recorded that some subjects began to draw "immediately," some began to draw after "some hesitation," and some started after "considerable hesitation." These notations refer only to the subjects' approach to the first drawing. The ESP scores obtained by these three groups were as follows:

	N	Mean Score
Subjects Drawing Immediately	18	40.83
Subjects Showing Some Hesitation	13	39.46
Subjects Showing Considerable Hesitation	2	31.50

Again, the difference between means is not significant, but these figures, together with those given just previously, do serve to suggest that the amount of time taken in the drawing task may indicate something of the subject's attitude beyond that which is shown in the form quality of his drawing. It is conceivable that a combination of drawing time and form quality may give a truer index of "expansion" or "compression" than form quality alone gives. A person who takes a long time and finally produces a drawing rated as expansive may actually have been quite inhibited in his attitude and may have produced a "pseudo-expansive" drawing only because he worked so long and earnestly at the task. The person who is truly expansive may be one who makes an "expansive" drawing quickly and naturally without any special effort. On the other hand, the person who makes a "compressive" drawing in a short period of time may not have the ability to express his ideas well nor the level of aspiration which would cause him to spend a great deal of time trying to do so. Certainly it is reasonable to suppose that the person who spends an unusual amount of time on his drawing and finally produces one which is rated as compressive is indicating an extreme degree of compression. These lines of thought are merely specu-

lative at this stage, but they do suggest that it might be profitable to continue this sort of analysis in other series.

APPENDIX

Supplementary Study of the Relation of the Form Quality in Different Types of Drawings Made by the Same Subjects

In the Individual Series, we collected not only drawings in clairvoyance tests, but also drawings of two other types: "free" drawings embedded in an ESP card test and "free" drawings made at home without reference to ESP tests. In both of these last two sets of drawings, of course, no attempt was made to reproduce an ESP target. It was thought that a comparison of the three types of drawings for each subject might give us information about the stability of expansion-compression as an expression of personality.

Each subject made a "set" of four drawings for each of the three types. Each set of drawings was given a numerical rating for expansion-compression by the two judges (C.E.S. and B.M.H.). In order to compare the types of drawings, the correlations of the expansion-compression ratings of the drawings by each subject were obtained. Table A presents the results of this study.

Table A

Correlations of Expansion-Compression Ratings of Drawings Made Under Different Conditions

Expansion-Compression Ratings Correlated	Number of Subjects	Correlation Coefficients	P
Clairvoyance Drawings and Free Drawings Made at Home	24	+.4745	.018
Clairvoyance Drawings and Drawings Between BT Runs	32	+.3185	.080
Drawings Between BT Runs and Free Drawings Made at Home	25	+.0506	.999

From these figures we see that the clairvoyance drawings are more closely related to the free drawings which the subjects made at home. Although the correlation between these two types of drawings is not significant, it is within the suggestive range with a prob-

ability of .018. It is rather surprising to find this large a correlation from drawings collected under such differing conditions.

The clairvoyance drawings are also positively related to the free drawings made between the BT runs, but the correlation is not significant. There appears to be no relation at all between the two kinds of "free" drawings—those made between the BT runs and those made at home.

When we considered the expansion-compression ratings of the "free" drawings made between card runs, we found that there was a marked shift toward compression. In the total of 33 subjects, 27 were rated compressives on these "free" drawings; whereas, in the clairvoyance tests, only 19 of the 32 subjects were classed as compressive. Moreover, when the subjects made "free" drawings at home, only 12 of the 25 made compressive drawings. Thus it seems reasonable to suppose that the compression in the drawings between card runs was due mainly to the time restriction. Under other conditions many of these subjects drew expansive pictures. Outside of the difference in experimenters, the main experimental difference seems to be the one regarding time. This is at least the tentative conclusion we draw from these data: when subjects are rushed in their drawing or limited as to drawing time, they tend to make compressive drawings.

When the ESP scores obtained in the card runs are divided on the basis of the expansion-compression shown in these two different sets of drawings, we get the following results:

CARD RESULTS DIVIDED BY EXPANSION-COMPRESSION IN DRAWINGS MADE BETWEEN RUNS

	N	Runs	Dev.	Av. Score
Expansive Subjects	6	24	−7	4.71
Compressive Subjects	27	108	+4	5.04

CARD RESULTS DIVIDED BY EXPANSION-COMPRESSION IN "FREE" DRAWINGS MADE AT HOME

	N	Runs	Dev.	Av. Score
Expansive Subjects	13	52	+ 7	5.14
Compressive Subjects	12	48	−14	4.71

None of these differences are significant. Only the results as divided by the drawings made at home are in line with former results: the expansive subjects scored above chance, and the compressives, below. On the basis of these results we cannot yet say whether or not the drawings for expansion-compression analysis must be made in an ESP test in order to have discriminative power.

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Parapsychology Laboratory
Duke University
Durham, North Carolina

BOOK REVIEWS

THE ENCYCLOPEDIA OF PSYCHOLOGY. Edited by Philip Lawrence Harriman. New York: Philosophical Library, 1946. Pp. vii + 897. $10.00.

Readers of the JOURNAL OF PARAPSYCHOLOGY will be interested in this one-volume *Encyclopedia of Psychology* chiefly because it contains a twenty-page article entitled "Parapsychology" written by Dr. Gardner Murphy. And this article itself will interest them for several reasons.

Not least among these is the fact that a recognized authority on the subject was invited to write an article on this topic for inclusion in the volume. Until recent years, most of the references to parapsychology appearing in psychological textbooks and reference works have tried to dismiss this field of problems as unworthy of serious scientific study. Only the critical literature was likely to get any consideration, and only those who had publicly denied the scientific basis of the findings were recognized as qualified to express opinions regarding the field.

The shift away from such obstructing tactics in the present volume is but one of many indications that both the scientists and the scientific-minded public are now looking to the parapsychologist to find out about parapsychology. Additional evidence of this encouraging trend is to be found, among other examples, in two contemporary publications, *American Thought—1947* (Gresham Press) and *Scientific Year Book of 1947* (Doubleday). Both of these volumes contain chapters on current findings in parapsychology written by a recognized research worker in the field. Is it too soon to say that this branch of science can no longer be ignored?

Dr. Murphy's article on parapsychology is an excellent survey of the history, problems, methodology, and findings of this field. It serves, by judicious selection from the vast literature and by expert presentation of these outstanding investigations, to give a broad introduction to the various lines of research and to the conclusions reached. A good idea of the scope of the survey is obtained from

a list of the subtitles of the different sections of the article: "History," "Spontaneous Telepathy," "Experimental Telepathy," "The Duke University Experiments and Their Sequels," "Psychological Factors in Scoring-Success," "Whately Carington's Free-drawing Method," "Precognition," "Psychometry," "Psychological Principles in ESP," "Interpretations," "Psychokinesis," "Mediumship," "Cross-Correspondences," and "Proxy Sittings." The reader who has not had either the time or the opportunity to gain a firsthand knowledge of the literature will be well repaid by a close study of the article. The student who may wish to go more thoroughly into the material presented will find the list of eighty references a valuable guide to further reading.

Prospective purchasers will naturally wish to know something about the volume as a whole. In the "Editor's Preface" we are told that the encyclopedia was planned to serve three major purposes. "First, it is designed to meet the requirements of the serious investigator who wishes to acquaint himself with various topics in modern psychology which lie outside his field of special interest and competence. . . . Secondly, the undergraduate and the graduate student often voice a desire for a book which may extend their acquaintance with topics mentioned in lectures or encountered in their reading. . . . In addition, it furnishes a useful book in which the student can browse with pleasure and benefit. Thirdly, it is intended to emphasize some of the trends in contemporary psychology which seem to have supplanted much of the traditional material."

A comparison of the present volume with two earlier reference works in the field throws considerable light upon the history of psychology during the last two decades. I refer to *Psychologies of 1925* and *Psychologies of 1930* (Carl Murchison, Ed., Clark University Press). At the time they were published, the method selected for getting a representation of the field of psychology within a single volume was that of inviting a limited number of advocates of different points of view (the so-called "schools of psychology") to present a comprehensive discussion of the entire field in the light of their individual approaches. Today, the plan adopted is that of getting a large number of individuals to discuss their "specialties" in psychology—research specialties, clinical methods, special applica-

tions, and the like. For example, in the book we are reviewing there are articles on the following titles: "Animal Neuroses," "Rat and Animal Psychology," "Infant Psychology," "Lie Detection," "Learning," "Personality," "Rorschach Method," and "Psychosomatics." These are only a few topics, selected from among the hundred or so treated to illustrate the scope of the volume. One receives the impression that present-day psychology is a cluster of activities without an integrative principle. It almost seems that psychologists have got rid of their "schools" by splitting up their subject matter into so many different compartments that it no longer serves any purpose to try to give names to the divergent points of view.

But the book is important, because it marks a definite period in the historical development of psychology. Perhaps the next decade or two will see the beginnings of a real integration of the sprawling field which the volume reveals. Whenever this takes place, it seems highly probable that parapsychology will make a major contribution to that objective.

J. G. PRATT.

GLOSSARY

In order to avoid constant redefining of commonly recurring terms in papers appearing in this JOURNAL, the following definitions are submitted for convenient reference.

*For a simple description of those terms marked by an asterisk, as they apply to the ESP test data, see Chapter VIII and the Appendix of *A Handbook for Testing Extra-Sensory Perception* by C. E. Stuart and J. G. Pratt. Further explanation may be found in any elementary statistical text.

AGENT: In tests for telepathy, the person whose mental states are to be apprehended by the percipient. In GESP tests, the person who looks at the stimulus object.

AVERAGE SCORE: Average number of hits per run.

CALL v.: To attempt to identify by ESP a stimulus object or a mental state of an agent.

CALL n.: The response described above; also the resulting selection.

*CHANCE: The complex of undefined causal factors irrelevant to the purpose at hand.
CHANCE EXPECTATION = MEAN CHANCE EXPECTATION: The most likely score if only chance obtains.
CHANCE AVERAGE: Mean chance expectation expressed as an expected score, generally in terms of average per run.

CHI-SQUARE: A sum of quantities each of which is a deviation squared divided by an expected value. Also a sum of the squares of CR's.

CLAIRVOYANCE: Extrasensory perception of objective events as distinguished from telepathic perception of the mental state of another person.

*CR (CRITICAL RATIO): A measure to determine whether or not the observed deviation is significantly greater than the expected random fluctuation about the average. The CR is obtained by dividing the observed deviation by the standard deviation. (The probability of a given CR may be obtained by consulting tables of the probability integral, such as Pearson's.)
CR OF THE DIFFERENCE: The observed difference between the average scores of two samples of data divided by the standard deviation of the difference.

DECK: Twenty-five ESP cards, five of each suit.

*DEVIATION: The amount an observed number of hits or an average score varies from the mean chance expectation or chance average. A deviation may be total (for a series of runs) or average (per run).

DIE THROW: The elementary unit of data in a dice-throwing test represented by the throwing and reading of a single die, no matter how many dice are thrown at a time.

EMPIRICAL CONTROL: An experiment which wholly or partially follows the main experiment with the exception that the conditions are designed to exclude the possibility of the hypothesis being tested.

ESP (EXTRASENSORY PERCEPTION): Response to an external event not presented to any known sense.

ESP CARDS: Cards, each bearing one of the following five symbols: star, circle, three parallel wavy lines (called "waves"), square, plus.

ESP SYMBOLS: See plate opposite page 1, this JOURNAL, Vol. 1, March, 1937.

EXPECTATION; see CHANCE.

EXTRACHANCE: Not due to chance alone.

FREE MATERIAL: The stimulus objects of experiments in which an unlimited or unspecified range of stimulus objects is employed (as contrasted with methods such as card-calling in which the subject knows that the stimulus object is one of a known range).

FREE RESPONSE METHOD: An ESP test method in which a relatively unlimited range of stimulus objects is used and in which the subject is instructed to express freely as his response any range of thoughts and ideas.

GESP (GENERAL EXTRASENSORY PERCEPTION): A technique designed to test the occurrence of extrasensory perception, permitting either telepathy or clairvoyance or both to operate.

HIGH-DICE TEST: A PK technique in which the aim of the subject is to try to influence a pair of dice to fall with the two upper faces totaling eight or more.

LOW-DICE TEST: A PK technique in which the aim of the subject is to try to influence a pair of dice to fall with the two upper faces totaling six or less.

MEAN CHANCE EXPECTATION; see CHANCE.

*P (PROBABILITY): A mathematical estimate of the expected relative frequency of a given event if chance alone were operative.

PARAPSYCHOLOGY: A division of psychology dealing with those psychical effects which appear not to fall within the scope of what is at present recognized law.

PERCIPIENT: The person who makes the calls in an ESP test.

PK (PSYCHOKINESIS): The direct influence exerted on a physical system by a subject without any known intermediate physical energy or instrumentation.

PRECOGNITION: Cognition of a future event which could not be known through rational inference.

PREFERENTIAL MATCHING: A method of scoring free responses. A judge ranks the stimulus objects (usually in sets of four) with respect to their similarity to, or association with, each response; and/or he ranks the responses with respect to their similarity to, or association with, each stimulus object.

PSI: A general term to identify personal factors or processes in nature which transcend accepted laws. It approximates the popular use of the word "psychic" and the technical one, "parapsychical."

PSI PHENOMENA: Occurrences which result from the operation of psi. They include the phenomena of both ESP (including precognition) and PK.

QD (QUARTER DISTRIBUTION): The distribution of hits in the record page (or in a logical subdivision thereof, such as the set or the half-set) as found in the four equal quarters formed by dividing the selected unit horizontally and vertically.

RUN: A group of trials, usually the successive calling of a deck of 25 ESP cards or symbols. In PK tests, 24 single die throws regardless of the number of dice thrown at the same time.

SCORE: The number of hits made in one run.

TOTAL SCORE: Total of scores made in a given number of runs.

AVERAGE SCORE: Total score divided by number of runs.

*SD (STANDARD DEVIATION): Usually the theoretical root mean square of the deviations. It is obtained from the formula $\sqrt{npq}$, in which n is the number of single trials, p the probability of success per trial, and q the probability of failure. (For ESP cards, SD $= 2\sqrt{\text{no. of runs.}}$) Sometimes the SD used is that estimated from the observed variability in the scores.

SD OF THE DIFFERENCE: For both ESP cards and PK tests using dice, the SD of the difference is equal to $\sigma_s \sqrt{1/R_1 + 1/R_2}$ where σ_s is the SD of a single run and R_1 and R_2 are the number of the runs in the respective samples compared. This gives the SD of the difference for run score averages.

SERIES: Several runs or experimental sessions that are grouped in accordance with a stated principle.

SESSION: A unit of an ESP or PK experiment comprising all the trials of one test occasion.

SET: A subdivision of the record page serving as a scoring unit for a consecutive group of trials, usually for the same target.

SEVENS TEST: A PK technique in which the aim of the subject is to try to influence a pair of dice to fall with the two upper faces totaling seven.

*SIGNIFICANCE: A numerical result is significant when it equals or surpasses some criterion of degree of chance improbability. Common criteria are: a probability value of .01 or less, or a deviation in the expected direction such that the critical ratio is 2.33 or greater.

SINGLES TEST: A PK technique in which the aim of the subject is to try to influence dice to fall with a specified face up.

STIMULUS OBJECT: The ESP card or drawing or other object, some identifying characteristic of which is to be apprehended by the percipient.

TARGET: In ESP tests, the stimulus object; or in telepathy, the mental state of the agent. In PK tests, the faces of the die (or combination of faces) which the subject attempts to bring up in the act of throwing.

TARGET CARD: The card which the percipient is attempting to perceive (i.e., to identify or otherwise indicate a knowledge of).

SUBJECT: The person who is experimented upon. In ESP tests, most commonly the percipient (though also the agent in GESP and telepathy). In PK tests, any individual whose task it is to influence the objects thrown.

TARGET DECK: The deck of cards the order of which the subject is attempting to identify.

TARGET FACE: The face on the die which the subject tries to turn up as a consequence of direct mental action.

TELEPATHY: Extrasensory perception of the mental activities of another person. It does not include the clairvoyant perception of objective events.

TRIAL: In ESP tests, a single attempt to identify a stimulus object. In PK tests, a single throw of the dice or other objects thrown.